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INDIANA

DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES

35th ANNUAL REPORT
1910

BLATCHLEY

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INDIANA.

DEPARTMENT

OF

Geology and Natural Resources.

THIRTY-FIFTH ANNUAL REPORT.

W. S. BLATCHLEY,
STATE GEOLOGIST.

1910.

INDIANAPOLIS:
WM. B. BURFORD, CONTRACTOR FOR STATE PRINTING AND BINDING
1911

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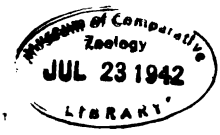


THE STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
December 29, 1910.

Received by the Governor, examined and referred to the Auditor of State for verification of the financial statement.

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, IND., January 4, 1910.

No financial statement.

JANUARY 4, 1911.

Returned by the Auditor of State, with above certificate, and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

MARK THISTLETHWAITE,
Secretary to the Governor.

Filed in the office of the Secretary of State of the State of Indiana, January 7, 1911.

L. G. ELLINGHAM,
Secretary of State.

Received the within report and delivered to the printer January 7, 1911.

A. E. BUTLER,
Clerk Printing Board.

STATE OF INDIANA,
DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES.

INDIANAPOLIS, IND., December 29, 1910.

HON. THOS. R. MARSHALL, *Governor of Indiana:*

MY DEAR SIR—In accordance with law I have the honor to submit to you herewith the manuscript and illustrations of the Thirty-fifth Annual Report of the Indiana Department of Geology and Natural Resources, the same being for the calendar year 1910.

Yours very truly,

W. S. BLATCHLEY.

ASSISTANTS.

W. M. TUCKER,.....Field Assistant.
RALPH F. BLATCHLEY.....Field Assistant.
JAMES EPPERSON.....State Mine Inspector.
JONATHAN THOMAS.....Assistant Mine Inspector.
ROBERT IRVING.....Assistant Mine Inspector.
ALBERT SAMS.....Assistant Mine Inspector.
FRANK I. PEARCE.....Assistant Mine Inspector.
B. A. KINNEY.....State Supervisor of Natural Gas.
ISADORA KESSLER.....Clerk.
MILLARD GILLIAM.....Messenger and Janitor.

TABLE OF CONTENTS.

INTRODUCTORY.

The report of the Director of the Indiana Department of Geology and Natural Resources for the calendar year 1910 is necessarily brief. The refusal in April of the State Board of Printing to publish a paper on the Coleoptera of Indiana in the annual report of 1909 necessitated its publication as a Bulletin from the Department if it appeared at all. The expense of its publication was paid from the expense fund of the Department, and as a result, but little field work could be accomplished during the season, as no funds were available to pay field assistants. Moreover, the time of the Director from April to November was wholly taken up in seeing the Bulletin on Coleoptera and the annual report of 1909 through the press, as a delay of two months and more were entailed in their publication by the action of the Printing Board.

The first paper in the volume is one by Wm. M. Tucker on the Water Powers of Southern Indiana. It is based mainly upon field work done in the summer of 1909 and one and one-half months' work in 1910. It was the intention to have the paper, when published, cover the power sites of the entire State, but the circumstances above mentioned prevented Mr. Tucker from performing the work, and the paper is, therefore, limited in scope to the streams of Southern Indiana.

In October, after the appropriation for the new fiscal year became available, Ralph F. Blatchley spent two months in the Oakland City oil field, gathering data for a report on the petroleum developments in that area. This data furnished the basis of the second paper of the volume. It is accompanied by a map showing the Oakland City oil field as it was on December 1, 1910.

The reports of the State Gas Supervisor, B. A. Kinney, of Marion, and the State Mine Inspector, James Epperson, of Linton, follow in the order mentioned.

Dr. O. P. Hay of Washington, D. C., for a long time Professor of Zoölogy in Butler University at Irvington, Indiana, is under contract to prepare a paper for the Department on the Pleistocene Vertebrates of the State. Dr. Hay is the acknowledged authority on Pleistocene Vertebrates in this country, and his paper will probably appear in the annual report for 1911. These animals include the Mammoth, Mastodon, Giant Beaver and many other forms which roamed throughout the State near the close of the Glacial period, and whose remains are frequently found in various portions of the State.

THE WATER POWER OF INDIANA.

BY W. M. TUCKER.

WATER POWER OF INDIANA.

BY W. M. TUCKER.

PART I.

INTRODUCTION.

The problem of water power in Indiana is one which will require several years of careful work to solve definitely. It is the most difficult of water power problems, because of two conditions: first, the water power of Indiana must be developed on low heads without great storage, and, second, the stream flow in Indiana is very irregular. In order to solve the problem definitely, it is necessary to determine for each site the exact geographical conditions surrounding it, and, the exact amount of water which can be depended upon at it. To determine the former, it is necessary to make a careful survey of each site, and to determine the latter, careful gage and current readings must be kept at one or more points on each stream to be investigated, for a period of several years. In the end, the time spent at each power site by the investigator, would probably average at least half the time spent thus far on the whole problem. The writer of this report does not claim that the results stated in the report are infallible, because sufficient time has not been spent to produce infallible results. The work, thus far, has been more for the purpose of locating power sites which are worthy of more careful investigation and to establish gages so that the data on stream flow will be accumulating. This work is only partially completed. A few more gages should be established. The rivers of the northern part of the State have not been traversed. Thus, this report is only a preliminary statement which the writer hopes will be of some benefit to those who continue the work.

In the preparation of this report the writer has received aid and suggestions from several persons whom he wishes to thank for favors. Mr. John A. Smith spent two months in the field during the summer of 1909. Dr. C. R. Dryer permitted the glacial

map from his "Studies in Indiana Geography" to be used. The United States Weather Bureau permitted the use of data. The United States Geological Survey also permitted the use of data. Several railroad companies have permitted the use of their road profiles to determine elevations. Dr. E. R. Cumings and Dr. J. W. Beede have offered many suggestions and criticisms. The gage readers mentioned in the report have been careful and obliging. Many favors from various people have been received while working in the field.

Artificial light and heat are of equal importance with food, clothing and shelter to the human race in this latitude. The common sources of our light and heat are wood, coal, oil and gas. Wood has been abandoned as a means of heating except for family use and in very small manufacturing plants. The disappearance of our forests and the slow growth of forest trees make any attempt to produce fuel from this source impractical. Authorities on coal have decided that the available coal will supply the present demand for only a few decades[1]. Gas and oil fields have been found to be even shorter lived than coal fields. The weight of authority seems to indicate that the next two centuries will practically exhaust these four common fuels. A proper conservation of the present supply will greatly extend the life of these fuels, but with the present increasing demand for power the final exhaustion is but a matter of time. In the face of this situation the question as to the means of supplying this deficiency naturally arises. Several answers have been offered to this question. Among the means suggested, the most plausible ones are direct sunlight, wind power and water power. At the present time little has been done along the line of the direct sunlight engine. However, it is possible and probable that an engine will be invented which will be run for practical purposes by direct sunlight. It is known that the sunlight which falls upon the roof of any ordinary factory is sufficient to produce more power than is used in the factory. If an engine could be invented that would successfully concentrate and utilize this heat, it would still be necessary to store the power for use during the time when the sun is not visible. This could probably be done by a more highly perfected type of storage battery. Wind power has been used for an indefinite time as a means of propelling pumps and other machinery that require but little power. Attempts to use wind power on a large scale have always proved unsuccessful. It

[1] Conservation of Natural Resources in the United States, by Chas. R. Van Hise. p. 23.

is even more inconstant than sunlight. Because of the inconstancy of both wind and sunlight it is probable that neither will ever be used for large scale power purposes.

Water power has long been used for practical purposes. Before the use of steam is was the propelling power of the small mills, and many of these mills are still used. Water power is inexpensive, perpetual, and requires less attention than any other power when it is once installed. While the water power of Indiana must be used on a low head, it is a resource from which thousands of dollars could be realized if it were properly installed and utilized. The New York Water Power Commission estimates a saving over steam in the State of New York by the development of additional water power through reservoirs at twelve dollars per horse power per annum.[2] It requires at least ten tons of coal to produce a horse power for a year.[3] If Indiana could substitute 50,000 horse power by water for as much now produced by steam, which in all probability could be done, it would mean a saving of 500,000 tons of coal per annum in addition to the $12 per horse power saved by the substitution. This would be of great economic importance in increasing the life of coal. The amount of developed power in Indiana is but a small fraction of the available power. A rough estimate places this at about ten per cent. At present there is much interest in water power and a few sites are being developed. The valuable farm lands in the valleys of White River and Wabash River are a great hindrance to the full development of the water power of the State. If in the future the fuels are exhausted and the use of direct sunlight is not found to be feasible, the lowlands along these rivers will be condemned and used for storage basins for water power purposes. Until the demand for power becomes imperative the entire power of the State will not be developed.

A proper development of the water power of Indiana would bring about several other important results. The navigation facilities would be greatly increased; the increased storage would tend to purify the water; and the reservation of water in the storage basins would tend to lessen the damage wrought by floods. The three problems, water power, navigation and protection from floods, are very closely related. The great problem in each case is to bring about a regular stream flow. The following statement from Van Hise bears directly on this point:[4]

[2] 4th Annual Report N. Y. State Water Supply Commission. p. 234.
[3] Conservation of Nat. Res. in the U. S., by Chas. R. Van Hise. p. 124.
[4] Conservation of Nat. Res. in the U. S., by Chas. R. Van Hise. p. 173.

"The greatest difficulty of navigation is the unequal stream flow. At one time the stream is in flood, overflowing its banks, rolling down with great velocity toward the sea; at another time it is comparatively small, indeed often being divided into several small streams trickling over its bed. The conditions in either case are not favorable to navigation; in the first, because of the velocity of the stream, and in the second, insufficient depth to carry a vessel. In the projected improvements, according to Leighton, the first and most important step is to so control the streams as to get a nearly uniform flow.

"The holding of flood waters, and therefore securing greater regularity, may be accomplished to a considerable extent by levees on each side of the river bank at some distance from the low water river channel, so as to make a basin. At times of flood the water rises above the banks, and so makes between the levees a long, narrow, temporary lake which may require several days to fill and empty. Such intermittent levee reservoirs prevent damage from floods and to a reasonable extent regularize the flow of the stream.

"In many cases, in addition to a system of levees such as indicated, it will be necessary to construct at the headwaters of the great navigable stream adequate systems of reservoirs. We have seen that the development of reservoirs is of immense importance with reference to water power. Also it is of equal importance with reference to navigation."

Immense reservoirs could be constructed in Indiana, but this would necessitate the destruction of much valuable farm land, as stated in a previous paragraph.

GEOLOGY OF INDIANA.

The geological formations of the State have much to do with the drainage of the State, and a short discussion will be given here to that subject. The rocks of Indiana belong to the Paleozoic era, of which the representatives of the youngest and oldest periods are of the State. Systems in parenthesis are not represented in Indiana:

Paleozoic	(Permian)	Merom Sandstone.
	Pennsylvanian	Coal Measures, Coal, Shale and some Limestone.
		Mansfield Sandstone.
	Mississippian	Huron Limestone and Sandstone.
		Mitchell Limestone.
		Indiana Oolitic Limestone.
		Harrodsburg Limestone.
		Knobstone, Sandstone and Shale.
		Rockford Goniatite Limestone.
	Devonian	New Albany Black Shale.
		Silver Creek.
		Sellersburg.
		Jeffersonville Limestone.
	Silurian	Lower Helderburg.
		Waterlime.
		Niagara Limestone.
		Clinton Limestone.
	Ordovician	Richmond Limestone and Shale.
		Lorraine Limestone and Shale.
	(Cambrian)	Eden Limestone and Shale.

The entire scale of rock in Indiana is sedimentary, composed of limestone, shale, sandstone and coal. In general the strata are horizontal, but there is a considerable dip toward the southwest which becomes more pronounced toward the southwest. Thus there is a continual change of formations from east to west across the State. However, each formation may be traced from the Ohio River northward for many miles until it disappears beneath the glacial drift. This arrangement has a peculiar effect upon the drainage of the southeastern part of the State. The Niagara and Clinton limestones are very hard and form a long, high divide almost on a line from Madison to Cambridge City. Whitewater River and some smaller streams skirt the east edge of these formations and flow south. West of this divide are the long, low grade tributaries of White River. Thus the Whitewater River and smaller streams drain the Ordovician formation of the State exclusively. On the other hand the White and Wabash Rivers flow directly across the rock formations of the State, and as each formation appears the previous formation disappears beneath it. This has a remarkable influence upon these streams in certain cases. An example of this is on the Muscatatuck. For about ten miles below Vernon this stream flows on Jeffersonville limestone. This limestone is hard and forms abrupt bluffs and a rocky bed for the stream. There is no underflow and the stream is of fair size. Near the Euler bridge the limestone disappears beneath the surface and the soft New Albany shale forms the bed of the stream. The valley broadens and is filled with a deep deposit of alluvium. Much of the water disappears as underflow. The diminished stream becomes filled with drift and could scarcely be recognized as the same stream.

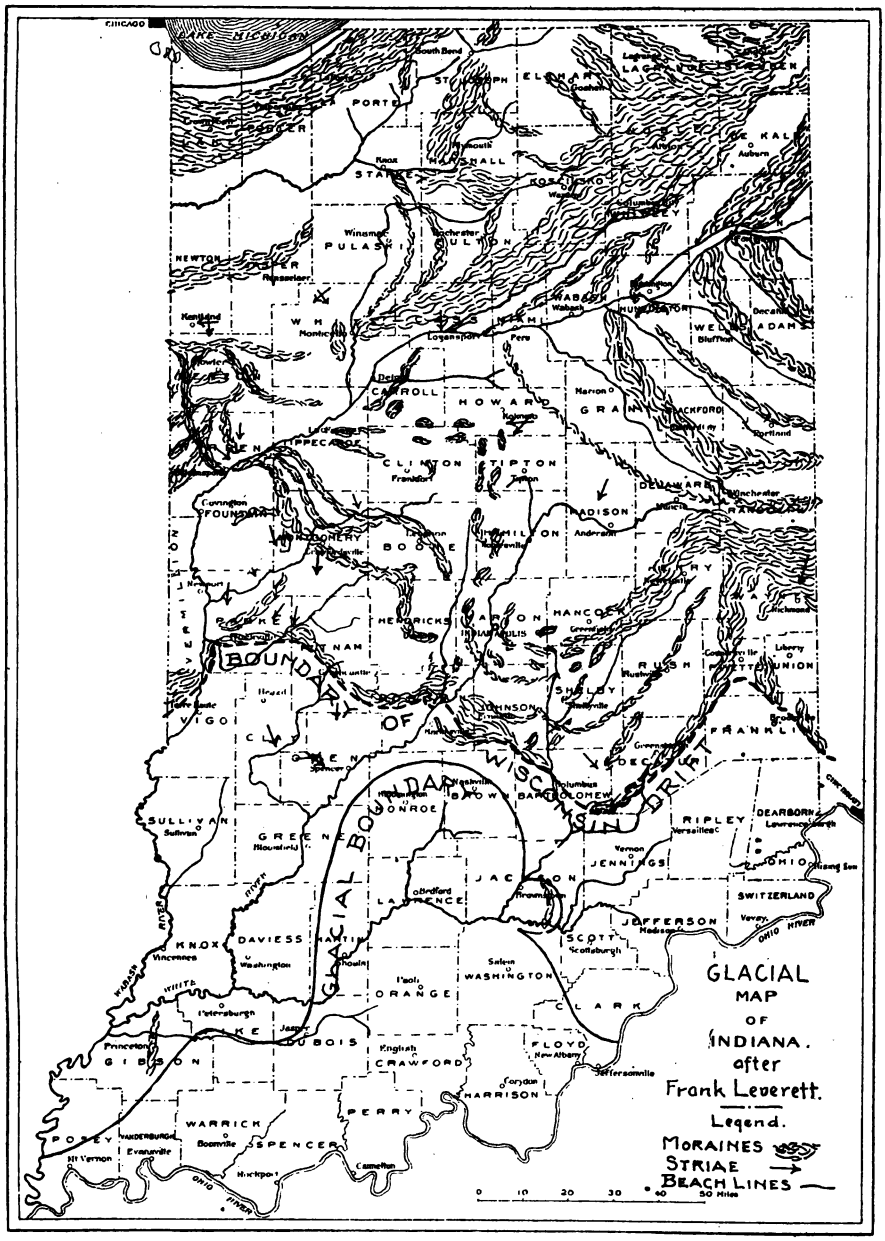
The softer formations weather more rapidly and the streams in these formations have broad valleys filled with deposits of alluvium. The general level of the country is also greatly reduced by erosion in these formations. Other formations are harder. In these formations the stream valleys are restricted and the general level of the country much higher. Thus the State has a series of plateaus extending in a north south direction across the State and representing the harder formations of rock. There are three of these plateaus which are very distinct. A line from Madison, Jefferson County, to Cambridge City, Wayne County, approximately represents the crest of the plateau formed by the Niagara limestone. A line from Jeffersonville, Clark County, to Danville, Hendricks County, is near the crest of the Knobstone plateau. The other plateau is formed by the Mitchell and Huron limestones and the Mansfield sandstone and is approximately represented by a line from eastern Perry County to Greencastle, Putnam County. These plateaus are partially or wholly obliterated by the deep glacial deposits in the central part of the State.

GLACIOLOGY OF INDIANA.

Much of Indiana has been glaciated. Two distinct periods of glaciation are usually recognized. The limits to which these glaciers reached are shown on the map, Fig. 1. The two glaciers are known as the Illinois and Wisconsin glaciers.

The Illinois glacier is the older of these and reached a more southerly limit. Much of the deposit of this glacier has been carried away by the streams. The streams have cut through the drift which it deposited and have their beds in the solid rock beneath. Thus this glacier has little bearing on the subject of water power.

The Wisconsin glacier, which is more recent, has obliterated to a great extent the previous drainage in the part of the State which it covered. During and since the disappearance of this glacier a new drainage has developed which has not yet carved its way through the heavy drift to bed rock. This condition has a marked effect upon the streams. The drift acts as a great storage basin for ground water. The continual appearance of this ground water causes the stream flow to be more uniform and permanent. The presence of many lakes in the Wisconsin glacial area also tends to regulate the flow of streams. Some of these lakes cover several square miles. No investigation as to the storage facilities of these lakes has been made. No lakes occur in the State outside of the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LAKE MICHIGAN
PORTER
STARKE
KOSCIUSKO
NOBLE
DE KALB
NEWTON
JASPER
PULASKI
FULTON
WABASH
WELLS
ADAMS
CARROLL
HOWARD
GRANT
CLINTON
TIPTON
DELAWARE
RANDOLPH
MADISON
MONTGOMERY
BOONE
HENDRICKS
HANCOCK
RUSH
UNION
PARKE
PUTNAM
VIGO
JOHNSON
SHELBY
FRANKLIN
DECATUR
BOUNDARY OF THE WISCONSIN DRIFT
GLACIAL BOUNDARY
MONROE
BARTHOLOMEW
SULLIVAN
GREENE
RIPLEY
DEARBORN
JENNINGS
OHIO
JACKSON
SWITZERLAND
JEFFERSON
KNOX
DAVIESS
MARTIN
LAWRENCE
SCOTT
WASHINGTON
ORANGE
CLARK
FLOYD
GIBSON
PIKE
DUBOIS
CRAWFORD
HARRISON
WARRICK
PERRY
SPENCER
POSEY
VANDERBURGH
WHITE
WABASH
OHIO RIVER
GLACIAL MAP OF INDIANA. after Frank Leverett.
Legend.
MORAINES
STRIAE
BEACH LINES
0 10 20 30 40 50 Miles

Fig. 1.

Wisconsin glacial area. Many streams flow south off of the edge of the Wisconsin glacial area and have long valley trains. A valley train is the deposit of glacial debris which is found beyond the glacial line in the valley of a stream which flowed from the edge of the glacier. The deposit was made during the glacial area by the stream which was then overladen with sediment. A valley train is usually composed of sand and gravel. These valley trains have an effect on stream flow similar to that of the glacial deposits proper, although not so extensive. The Whitewater, White and Wabash rivers have great valley trains. Good dam sites are hard to locate when a valley is filled with glacial drift.

TOPOGRAPHY OF INDIANA.

The topography of Indiana bears a close relation to its glacial history. It may be divided roughly into three divisions, to which reference has already been made, i. e., the Wisconsin glacial area, the Illinois glacial area and the nonglaciated region. The Wisconsin glacial area forms the major part of the State. It is a topographically young region with an undulating surface due to glacial forms. The soil is deep and is composed largely of clay, sand and gravel. Little rock is exposed. Occasionally the streams have cut through the drift and exposed the underlying rock.

The Illinois glacial area is much older than the Wisconsin and the streams have cut through the drift to the underlying rock. The larger streams have practically reached base level and have begun to widen their valleys. The soil is not so deep as that of the Wisconsin area. It contains little sand and gravel deposits except in the valley trains from the Wisconsin area.

The nonglaciated area is a typical mature region. Little level land occurs and the drainage is perfect. The streams of this region are flooded during rainy seasons and dry or very much diminished during dry weather. The Mitchell limestone belt, which extends from Mauckport, Crawford County, to Waveland, Montgomery County, is an exception to the foregoing statement. In this belt the drainage is to a great extent subterranean on account of the extensive development of caves. This condition causes the runoff of this belt to be much more uniform than the runoff of the rest of the nonglaciated region. The surface of this belt is undulating and covered with sinkholes. Blue River is in this belt. The east fork of White River crosses the nonglaciated region from Seymour to the west line of Martin County.

HYDROGRAPHY OF INDIANA.

The Wabash and White rivers drain the major part of the State. All of the State except the extreme northern and northeastern part drains into the Mississippi. The Maumee, Calumet and St. Joseph rivers drain the northern part into the Great Lakes. The White and Wabash rivers are of much the same character. Both are long streams formed by many tributaries. Both have a slight fall throughout their courses. Both flow off the Wisconsin glacial area and have long valley trains. Blue River, which drains Washington, Harrison and Crawford counties, and Whitewater River, which drains the southeastern part of the State, have much higher gradients than the White or Wabash. They are small streams and partake of the nature of the headwaters of the larger streams. Both these streams have a fairly regular flow. In the case of Blue River this is due to the underground drainage of the Mitchell limestone, while in the case of Whitewater River it is due to the vast amount of glacial gravel deposited at its source.

No swamps or lakes of any considerable size occur in the southern part of the State. The lowlands along all streams are very valuable farm lands. This fact makes available storage basins very scarce under the present demand for water power. However, if the time comes when the water power will be more valuable than the farm land, good storage basins can be constructed. At the present time the feeder dam with the long head race seems to be the best means of utilizing power on the larger streams.

ACCESSIBILITY OF WATER POWER.

Much of the water power of the State is not accessible under the present conditions except by transmission in the form of electricity. Electricity can be successfully transmitted for 150 to 200 miles. Blue River has no outlet for the products of its power except at Milltown, where it is crossed by the Southern Railway. However, all the power of this stream lies within forty miles of Louisville, Ky. The Whitewater River is paralleled by the Whitewater Division of the C., C., C. & St. L. Railroad. This road is a branch line and not in first-class condition. The power from this stream could be transmitted to Cincinnati, O., Richmond, Ind., and other small cities in the vicinity. The east fork of White River is paralleled by the P., C., C. & St. L. Railroad from Edinburg to Seymour and by the B. & O. S.-W. Railroad from Seymour to Washington. It is also crossed by the Monon and Southern Indiana rail-

roads at Bedford and Seymour respectively. The west fork of White River is paralleled by the L. E. & W. Railroad from Noblesville to Indianapolis and by the I. & V. Railroad from Indianapolis to Edwardsport. It is also crossed by the Monon, Indianapolis Southern and Southern Indiana railroads at Gosport, Bloomfield and Elnora respectively. Both forks of White River are paralleled by traction lines on their upper courses. The power on the Wabash is more accessible than that on the previously mentioned streams. Large cities are located on its banks at intervals of fifteen to twenty-five miles and small cities are more numerous. The railroad facilities in this part of the State are well developed. One of the best power streams in the State is the St. Joseph. Only a small portion of this stream is in Indiana, but it has a steep grade, a deep and narrow channel, a good volume of water and a steady flow. At least two large power plants are now in operation on this river. This power is used at South Bend, Mishawaka and vicinity.

CLIMATE OF INDIANA.

The climate of Indiana is very uncertain. Sudden changes of weather are very common. The prevailing winds are from the southwest, but the passing of a cyclonic storm often causes the wind to blow from every quarter in the twenty-four hours. The mean annual rainfall of Indiana is about forty inches. The rainfall varies considerably from year to year and the monthly and geographical distribution vary greatly. The following table shows the mean annual and mean monthly rainfall for the years 1900 to 1909, inclusive:

(This table is given in inches of rainfall.)

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mn. An.
1900	1.71	3.77	2.06	1.64	4.96	5.54	4.66	3.41	2.06	2.56	4.26	1.20	37.83
1901	1.44	1.66	3.40	2.67	2.54	4.35	1.30	3.10	1.54	3.35	1.30	3.29	30.57
1902	1.41	1.00	3.12	2.05	4.32	7.45	3.38	2.26	4.76	2.58	3.68	4.07	40.08
1903	2.28	4.40	2.95	4.43	3.16	3.72	3.51	3.91	1.85	2.67	1.82	2.16	39.96
1904	4.18	2.54	8.10	3.32	3.33	3.04	2.95	2.46	3.44	1.06	0.36	3.48	38.64
1905	2.16	2.05	2.52	3.74	5.96	3.61	4.59	5.03	3.48	4.89	2.68	2.43	43.70
1906	3.09	1.33	5.16	2.13	2.30	3.44	3.18	4.67	4.07	1.95	4.09	4.20	29.82
1907	6.95	0.48	4.90	2.80	3.71	4.69	4.95	3.83	2.90	2.73	2.79	4.09	44.98
1908	1.63	5.79	4.40	4.40	6.28	2.00	2.94	1.93	0.97	0.34	2.03	1.59	34.70
1909	3.67	5.82	2.88	5.16	4.71	5.16	5.26	3.00	2.66	3.70	3.21	3.09	47.75

The following maps (Fig. 2) for the years 1908 and 1909 are fair representations of the geographical distribution of the precipitation over the State.

The temperature of the State is as variable as the rainfall. Sudden and radical changes are common. While the mean annual temperature of the State does not vary greatly, the mean monthly temperature is very variable. The following table shows the mean monthly and mean annual temperature of the State for the years 1900 to 1909, inclusive:

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mn. An.
1900.....	32.6	26 5	35.6	52.4	64.8	71.1	75.6	78.7	70.3	61.9	42.8	33.2	53.8
1901.....	30.4	23.4	40.4	48.7	60.7	73.4	81.2	75.0	66.8	55.8	38.6	26.9	51.9
1902.....	28.4	21.5	43.6	50.8	66.2	69.6	75.7	71.1	63.8	56.7	49.5	29.7	52.2
1903.....	27.2	29.8	46.7	51.8	65.4	66.0	74.9	72.1	66.5	55.1	38.4	24.2	51.5
1904.....	21.7	24.5	40.7	46.8	62.0	69.6	73.0	71.2	67.2	53.8	41.9	29.2	50.1
1905.....	23.1	20.9	46.0	51.7	63.6	71.7	73.9	74.1	67.8	54.1	41.7	32.9	51.7
1906.....	35.4	28.7	31.9	54.6	63.7	70.9	73.7	76.1	70.4	54.1	41.9	33.8	52.9
1907.....	34.1	29.5	48.3	43.4	56.8	67.9	74.8	71.7	65.8	51.7	39.7	33.9	51.5
1908.....	30.8	29.0	45.2	52.7	63.9	70.8	75.5	73.9	70.2	54.9	43.9	34.1	53.8
1909.....	31.9	36.1	39.6	50.8	59.9	72.2	72.6	75.0	64.3	50.3	50.9	24.0	52.3

FORESTS OF INDIANA.

Eighty-five per cent. of the area of Indiana was originally heavily forested. The prairie district occupied a small portion of the northwestern part of the State. In this part the timber was confined principally to the lowlands. In all parts of the State the timber has been cut for lumber and to clear the farm land, until now only twenty per cent. of the original forest, seventeen per cent. of the total area of the State, remains. The cutting off of the forests of the State has had a great influence on the drainage. When the forests were still intact, the fallen leaves, mold and shade tended to retain the surplus of water during the rainy seasons, and this water, given out gradually, tended to equalize the stream flow. Floods were less common then and the streams flowed more uniformly. The removal of the forests and the systematic drainage of the land causes the water, during the rainy seasons, to flow directly into the streams. Thus the streams are flooded during the wet weather and soon dry up after the rains cease. This condition is especially true of the portion of the State south of the Wisconsin glacial boundary. In the Wisconsin glacial area the sand and gravel deposits serve to some extent the same purpose as the leaves, mold and shade of the previously forested area of the unglaciated region. The effect of the removal of the forests is shown by the remains of old water-mill sites, on small streams which are now dry for more than half the year. Many of these small power mills were run continuously fifty years ago. These power sites are now

from ten to forty feet. In this region, notwithstanding national forests and great storage reservoirs, at times of flood a large amount of water has been allowed to go down to the sea. The streams gain their water in the mountains from which they emerge to the lowlands through cañons. At the mouth of the cañons are great coarse alluvial cones. Recently a concrete headgate has been placed across the Santa Ana, the largest of the rivers of the San Bernardino range, so that at times of flood the water may be diverted from its bed and spread over the sand and gravel of the cone; the water is rapidly absorbed by this coarse material and passes underground. In this way the level of the underground water in the San Bernardino basin has been raised a foot, notwithstanding the increasing demand upon the underground reservoir. This method of preventing water from flowing to the sea in arid regions, where the streams come out of cañons at the mouths of which are alluvial cones, is likely to have a wide extension in the West.

"The above is a somewhat special method of getting the precipitation underground. On a much wider scale increasing the proportion of precipitation which goes underground may be accomplished by covering the earth with vegetation, by contour plowing, and by cultivating in such a manner as to leave a rough surface."

The whole of this quotation simply shows the opinion of an expert upon the subject of conservation of water. The paragraph concerning the West shows the care taken by agriculturists in that section of the country to take care of all the water possible. The last paragraph is applicable to Indiana. It is indeed astonishing to notice the poor grade of farming carried on in many parts of the state. Fields are left absolutely bare for a whole summer and some for years. Such fields not only drain off most of the water which falls upon them, but the hard, bare crust causes the evaporation of underground water to be much greater. Upon such fields even a rank growth of weeds is a blessing, except for the seeds which they produce. One of the secrets of successful farming in this State is the power of the farmer to properly handle the ground water under his land. When every farmer understands the secret of conserving ground-water and puts this knowledge to practical use, the dry well and intermittent spring problems will be greatly lessened and the facilities for waterpower will be somewhat increased.

PART II.

RIVER SYSTEMS OF INDIANA.

THE WHITEWATER SYSTEM.

The Whitewater River is located in southeastern Indiana. It rises by two main branches in southern Randolph and Wayne counties. The West Fork flows in a general southerly direction past Cambridge City and Connersville. Between Laurel and Metamora, in Franklin County, it bends toward the east and flows in that direction for eleven miles to Brookville, where it is joined by the East Fork. The main stream bends immediately to the southeast and flows in that direction to its mouth at Valley Junction, Ohio, where it empties into the Big Miami River. The East Fork flows in a general southerly direction from Richmond to Brookville, where it joins the West Fork. It is parallel to the West Fork and about ten miles to the east of it.

Whitewater valley is situated in the rocks of the Cincinnati series. The west bluff of the West Fork, throughout its course above Metamora, is capped by a considerable thickness of limestone of the Silurian age (Clinton and Niagara). The Niagara forms a distinct divide parallel to and just west of the West Fork, along its upper course. The crest of this divide forms the western edge of the Whitewater basin. This condition causes the western tributaries to the West Fork to be very short and very swift streams.

The Whitewater basin lies entirely within the area covered by the Illinois glacier. The Wisconsin glacial boundary makes a great bend northward in this vicinity. It crosses the West Fork near Alpine and the East Fork near Fairfield, in Franklin County. All the larger tributaries have their sources in the Wisconsin glacial area. The main parts of the trunk streams, however, lie outside of this area. A great valley train, which fills the valley to a depth of approximately a hundred feet, extends throughout its course south of the Wisconsin glacial line. This valley train is composed of sand and gravel. The head waters of both forks are in the deep glacial deposits of the Wisconsin area. These conditions make the discharge from the stream fairly constant.

The drainage basin of the Whitewater River in Indiana occupies practically four counties—Wayne, Fayette, Union and Franklin. Small portions of these counties drain to other streams and small

portions of other counties drain into Whitewater. The approximate drainage area of Whitewater in Indiana is 1,300 square miles. The United States Weather Bureau has five observation stations in and near this basin, and the record of these stations will be used in computing the amount of water furnished to the basin. The stations are at Richmond and Cambridge City, Wayne Co.; Connersville, Fayette Co.; Mauzy, Rush Co., and Greensburg, Decatur Co. The following table shows the mean annual precipitation in inches at these stations for the years 1900 to 1909, inclusive:

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Richmond	40.59	26.97	37.56	34.08	35.65	41.72	31.71	48.78	33.64	48.38
Cambridge City	39.65	31.55	40.25	41.69	40.39	*	34.21	46.54	32.57	48.99
Connersville	40.26	26.13	38.75	36.09	37.61	46.96	40.93	43.80	37.32	43.73
Mauzy	39.17	31.11	43.23	40.11	40.26	48.94	41.20	47.08	33.96	45.70
Greensburg	*	*	44.59	42.29	41.66	43.88	37.88	43.09	32.61	*
Mean	39.92	28.94	40.88	38.85	39.11	45.37	37.19	45.86	34.02	46.45
Average mean annual for ten years										39.66

*Report missing.

The rainfall of this basin, as shown by this record, is slightly more than the average rainfall of the State during the same period If all this water were carried away it would represent a discharge of 4,557.8 cubic feet per second for the ten years. The runoff of any region in Indiana is from 30 to 35 per cent. of the precipitation. This would give an average runoff of about 1,500 cubic feet per second. The rest is lost by evaporation, etc. By evaporation is meant the direct evaporation into the air and also that taken up by plants and animals. Another source of loss is by seepage through the underlying strata. The conditions for such loss in this valley are good in one respect, i. e., the dip of the underlying strata is about thirty-five feet per mile toward the west and this basin skirts the edge of a thickness of three to four hundred feet of these strata. On the other hand, the underlying strata are composed of shale and limestone which are almost impervious to water. Hence it is probable that there is little loss from this cause. A greater source of loss in this valley is from the underflow which penetrates the valley train, to which reference has already been made. The loss from this cause is great, for the sand and gravel is extremely pervious. This loss could be overcome by constructing a dam to the solid rock beneath the valley train. This would entail heavy expense and will not be done while the demand for power is no greater than at present.

The water power now used on Whitewater River is a very small per cent. of the available power. The East Fork and main stream have no developed power. The West Fork has two systems developed. One is at Connersville and the other at Metamora and Brookville. Both are of the feeder dam type. In the early part of last century a commercial canal was built by the government along the main stream and the West Fork. It extended from the Ohio River up the Whitewater River and northward. In the latter part of last century this canal was abandoned for commercial purposes. Hydraulic companies have taken advantage of this abandoned canal for the construction of power systems. Seven miles north of Connersville a dam has been constructed across the West Fork and the water turned into the canal. The canal conducts the water to Connersville, where it is used for power. The total fall in the canal from the crest of the dam to the tail-race at Uhl and Snider's mill is eighty feet. Of this fall, fifty-three feet are used. Five plants use power from this system. The water is first divided between the Connersville Waterworks Co. and the Connersville Furniture Co. The Waterworks Co. employs a thirty-six inch wheel on eighteen feet fall and receives eighty horse-power. The Furniture company employs a thirty-inch wheel on the same fall and receives fifty horse-power. The water then unites and is used by the McCann Milling Co. They employ a thirty-five inch wheel on nine feet fall and receive fifty to sixty horse-power. The water is then divided between the P. H. and F. M. Roots Manufacturing Co. and the Uhl and Snider Flour Mill. The Roots Manufacturing Co. employs a twenty-one inch wheel on twenty-three feet fall and receives ninety horse-power. The Uhl and Snider mill employs a twenty-one inch wheel on twenty-six feet fall and receives one hundred and eight horse-power.

Table showing power used on this system:

Plant.	Head.	Water.	Wheel.	Power.
Connersville Furniture Co	18 ft.	Portion	30 inch	50 H. P.
Connersville Waterworks Co	18 ft.	Portion	35 inch	80 H. P.
McCann Milling Co	9 ft.	All	35 inch	50–60 H. P.
P. H. & F. M. Roots Mfg. Co	23 ft.	Portion	21 inch	90 H. P.
Uhl & Snider Flour Mill	26 ft.	Portion	21 inch	108 H. P.
Total	.....	.....	.....	388 H. P.

On Oct. 30, 1909, a current reading on this canal between the Waterworks and the McCann mill showed a discharge of 86.02 cubic feet per second. The formula for reducing this to horse-power

is $\frac{\text{discharge} \times \text{feet fall}}{11}$ = horse-power (practical) or eighty per cent. of the absolute power. The entire fall employed on this system is fifty-three feet. An application of the above formula shows a practical power of 414.46 H. P. with the water as per current reading and the fall of fifty-three feet. This shows a loss of but 26.46 H. P. on the fall employed. According to these figures the wheels on this system are very efficient. However, one current reading does not give sufficient data from which to generalize, and since the year 1909 had a precipitation above the average and since the months of September and October were above the average for these months in the last ten years, it is not safe to make a definite conclusion regarding this system.

If we consider that six inches per mile is sufficient fall for a hydraulic canal, we find that the available head is 76.5 feet. This gives us a practical power of 598.23 H. P. All this power could be produced at small expense. Therefore there is a loss of 210.23 H. P. on this system with the amount of water that was flowing on October 30, 1909.

This system is owned and controlled by the Connersville Hydraulic Co., of which Mr. E. D. Johnson is manager.

One mile below Laurel in Franklin County is another feeder dam which turns the water from the river into the canal again. The canal conducts the water sixteen miles to Brookville, where it empties into the river. The total fall from the crest of the dam to the tail-race at Brookville is eighty-five feet. Of this fall twenty-eight feet are used. At Metamora, five miles below the dam, the Metamora Flour Mill employs a fifty-inch wheel on eight feet fall and receives thirty horse power. At Brookville, sixteen miles below the dam, the Thompson and Norris paper mill employs two twenty-nine inch wheels on twenty feet fall and receive two hundred and seventy-five horse-power.

Table showing power used on this system:

Plant.	Head.	Wheel.	Power.
Metamora Flour Mill	8 feet	50 inch	30 H. P.
Thompson & Norris Paper Mill	20 feet	(2) 29 inch	275 H. P.
Total			305 H. P.

On October 30, 1909, two current readings were taken on the canal of this system. One was taken at the source of the canal and showed a discharge of 117.43 cubic feet per second. The other was

taken near the C., C., C. & St. L. depot at Brookville and showed a discharge of 159.34 cubic feet per second. These readings show that the canal is replenished by ground water along its course, for there was no surface water entering it when the readings were taken. Small springs are common along the foot of the bluffs in this locality. If the smaller amount of water is considered available at Metamora, the practical power on eight feet fall is 85.4 horse-power. Thus there is a loss of 55.4 horse-power at the Metamora site. This is not due to inefficiency of the wheel, but to the fact that only part of the water is used. At least half of the water does not go through the wheel at this place. Considering the larger amount available at Brookville, the practical power on twenty feet fall is 289.7 horse-power. This gives a loss of only 14.7 horse-power, and indicates a high efficiency of the Brookville plant. If the average of the two readings be taken for the whole canal, the discharge would be 138.38 cubic feet per second. The entire fall on the system is eighty-five feet, and if six inches per mile be deducted for flow there is a fall of seventy-seven and one-half feet on the system. This gives the practical power of the system as 968.66 horse-power. Thus the loss of power on this system is 663.66 horse-power. Much of this is lost in abrupt falls in the old canal locks. It could all be employed at very small expense. This system is owned by the Brookville-Metamora Hydraulic Company, of which Mr. W. D. Bradt of Brookville is president.

The single current readings on these canals do not give adequate knowledge of the available power, but the estimates are very approximate, and there is no doubt that the power estimated above could be produced constantly except in very long drouths. A considerable amount of water was leaking through the dam at Laurel on the day the readings were taken. None was passing over it. The dam is of wood and cannot be made entirely tight. However, if it were replaced by concrete the entire volume of the stream could be turned into the canal during low water. This dam is located on a solid rock bottom. The river has abandoned its preglacial valley at this point and has made a cut across a point of rock, leaving an isolated mound standing in the valley. The dam is located in this cut. It is the best dam site on Whitewater River.

No power is used between Connersville and Laurel. The fall between these points is not known, but it is at least as much as the fall between Laurel and Brookville. The old commercial canal in this portion of the valley is in bad repair where the tributaries

cross it, but in other parts is in good condition. This canal could be repaired at a very reasonable cost, and the power developed as it is above and below. The loss of power in this part of the stream is estimated at from 900 to 1,000 H. P.

On the main stream below Brookville the fall is heavy and the volume of water much greater. The East Fork is not as large as the West Fork, but there is little difference in the volume of the two streams. Thus the volume is practically doubled at the junction. The distance from Brookville to the state line at Harrison is fifteen miles. The estimated fall is 115 feet.

A gage was established at New Trenton, Franklin County, on August 12, 1910, and current readings taken at the same time, with the following result:

Date.	Cross Section.	Gage Height.	Discharge.
August 12, 1910	268.9 sq. ft.	3.45 ft.	266.98 cu. ft.

The discharge of 266.98 cu. ft. per second gives a practical power of 24.27 H. P. per foot fall. On a fall of 115 ft. the power would be 2,791 H. P. When the above current reading was taken the river was very low, but since no gage readings had been taken prior to that time it is not known that the stage was extreme low water. It is probable that a power of 2,000 H. P. could be produced constantly on this part of the river. The development of this power would be greatly reduced in cost and labor by the presence of the old commercial canal, which is in fair repair.

No investigation of the power on the East Fork has been made. It is not as large as the West Fork. Its drainage basin is practically half that of the West Fork. There has been no commercial canal along it, and for this reason the installment of power systems would be more expensive. However, the same sort of gravel terraces are found here that are found on the West Fork, and these make the construction of power canals much more simple than on streams where they do not occur. The conditions for the full development of the power on both forks of Whitewater are very good.

The gage, which was installed at New Trenton August 12, 1910, is being read daily by Alfred Brown, and if the investigation of water power is continued definite data can be obtained from this station.

BLUE RIVER SYSTEM.

The main stream of Blue River forms the boundary between Harrison and Crawford Counties. It rises in central Washington County and drains the southern half of the county. It drains the eastern half of Crawford County, and the western part of Harrison County. The basin contains approximately 450 square miles. The drainage area is uncertain, because the system lies entirely within the Mitchell limestone belt, in which a large portion of the drainage is subterranean. Thus a river may drain more or less than its apparent basin. Large springs are common along the stream and each comes from an underground cavern. The extent of the caverns is unknown. The whole system lies within the unglaciated region. The topography is very rough, a typical mature region. The hills are approximately 300 feet high above the river near its mouth and gradually diminish in height toward the source.

The gradient of the stream is very steep. The average fall from Milltown to the mouth is 5.34 feet per mile. Although the drainage area is small, the underground drainage causes the flow to be more constant than on other streams of the same size. The U. S. Weather Bureau has four observation stations in or near this basin. They are located at Jeffersonville, Floyd County; Marengo, Crawford County; Salem, Washington County, and Paoli, Orange County. The following table shows the mean annual precipitation at these places for the last ten years, in inches:

	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.
Jeffersonville	37.11	31.17	41.91	35.78	55.10	49.65	43.67	46.28	37.62	37.48
Marengo	44.85	32.37	51.18	37.88	53.20	62.27	42.53	57.97	34.24	*
Salem	37.03	32.09	46.15	38.63	53.60	42.25	36.44	58.04	34.09	57.24
Paoli	43.01	29.12	49.43	35.18	52.90	*	45.25	55.86	33.01	49.25
Mean	40.50	31.20	47.04	36.87	53.70	51.39	41.97	54.54	34.74	49.99
Average mean annual for ten years										44.19

*Report missing.

The average is 4.69 inches higher than the average precipitation for the State during the same period. If all this water were carried away by the river it would represent a discharge of 1,464.9 cu. ft. per second for the ten years. The loss by evaporation, which is unknown, must be deducted from this. It seems that the subterranean drainage reduces the evaporation. Another source of loss

of water from this stream is by underground drainage. How extensive this loss is, is unknown, but the probability is that the gain through the same agency is as great or greater than the loss. The apparent basin is probably very near the same as the real basin.

The investigation of Blue River has been carried on only from Milltown to the mouth. Throughout the whole of this course the valley is narrow and bounded by steep bluffs of Mitchell limestone. The valley contains little bottom land. The river bed is rocky. The river consists of long reaches and abrupt rocky ripples. Favorable dam sites are very common, and the Mitchell limestone is a convenient and excellent material for the construction of dams of either concrete or masonry. The inaccessibility of this region makes the demand for power very small. However, this small stream has abundant power which can be developed easily and at small expense.

Three powers are now being used on this stream, and one on a tributary from Wilson's Spring. The three powers are at Milltown, Rothrock's Mill and White Cloud. The mill on Wilson's Spring branch is known as Le May's mill.

The Milltown mill is located at Milltown, four hundred feet below the Southern Railroad bridge. The dam is of wood and affords a head of seven feet five inches. The government permit on this dam is for eight feet. The mill in which this power is used is located on the west end of the dam. It was built in 1872 and employs three wheels each forty-eight inches in diameter. The total power received is about forty horse-power. This power is constant except in times of extreme drouth. It was employed every day during the year 1908, which was an exceptionally dry year. The Milltown Milling Company owns and employs this power.

Rothrock's mill is located in Sec. 11, T. 3 S., R. 2 E. The dam is of stone except the middle section, which is of wood. This section will be replaced by stone. The dam is one hundred and fifty feet in length and affords a head of 5.15 feet. There is no government ruling on this dam. The mill is located on the east end of the dam. A single thirty-six inch wheel is used which furnishes twenty horse-power. The power is used for sawing and planing. This mill was built about 1840. It is owned and run by Rothrock Brothers.

White Cloud mill is located at White Cloud, in Sec. 30, T. 3 S., R. 3 E. The dam is 210 feet long and affords a head of five feet. It is constructed of stone and cement. A canal five hundred feet long

increases the head to 8.25 feet. The mill is located 500 feet below the dam. Two forty-eight inch wheels and one forty-inch wheel are used on this fall, and about fifty horse-power is received. The mill was originally a flour mill, but is now used as a saw and feed mill. The present mill was built in 1880 and is owned and operated by Wm. Rothrock.

Le May's mill is located one mile north of White Cloud, in Sec. 19, T. 3 S., R. 3 E. It is located at the mouth of a tributary to Blue River from Wilson's Spring. This tributary is about one mile long and receives its entire volume of water from Wilson's spring, except in rainy weather. This spring is probably the largest in the State. The dam is one hundred feet from the mouth of the tributary. It is built of wood and is fifty-five feet long. It affords a head of eight feet. The mill is located on the north end of the dam and employs two thirty inch wheels. Thirty horse-power is produced. It is used in making implement handles. This mill is owned and operated by Mr. Le May. The first mill on this site was built by Hon. William Henry Harrison in the early part of the last century.

Table showing power used on Blue River:

Plant.	Head.	Wheels.		Power.
		Number.	Size.	
Milltown Mill	7.4 feet	3	48 inches	40 H. P.
Rothrock's Mill	5.15 feet	1	36 inches	20 H. P.
White Cloud Mill	8.25 feet	3	48 & 40 inches	50 H. P.
Le May's Mill	8.0 feet	2	30 inches	30 H. P.

Seven small power stations could be operated to an advantage between Milltown and the mouth of Blue River. The fall in this distance is 155 feet from the crest of the Milltown dam to low water mark on the Ohio River. All of this fall is available and practicable for power, except near the mouth where the back water from the Ohio River would interfere with it. The seven stations are located as follows: Milltown at present site; the Narrows, Sec. 22, T. 2 S., R. 2 E.; farm of John Hannell, Sec. 34, T. 2 S., R. 2 E.; Babcock's mill site, Sec. 36, T. 2 S., R. 2 E.; Rothrock's mill at present site; at extreme end of large bend below Sharp's mill, Sec. 13, T. 3 S., R. 2 E.; Wiseman Ripple, Sec. 35, T. 3 S., R. 2 E.

Table showing estimated distances, by stream, and fall between these stations:

Station.	Distance.		Fall.	
	From Milltown.	From Previous Site.	From Milltown.	From Former Site.
Milltown	00.0 miles	00.0 miles	7.5 feet	7.5 feet
Narrows	2.5 miles	2.5 miles	22.5 feet	15.0 feet
Hannell's	5.0 miles	2.5 miles	32.5 feet	10.0 feet
Babcock's	8.0 miles	3.0 miles	48.5 feet	16.0 feet
Rothrock's	11.0 miles	3.0 miles	64.5 feet	16.0 feet
Sharp's	15.0 miles	4.0 miles	79.5 feet	15.0 feet
Le May's (Loss)	17.0 miles	2.0 miles	82.5 feet	3.0 feet
Wiseman's	25.0 miles	8.0 miles	135.5 feet	53.0 feet
Mouth (Lost)	29.0 miles	4.0 miles	155.0 feet	19.5 feet

The distances given above are to the end of each proposed tail race. Only two absolute elevations are known on Blue River. The crest of the Milltown dam is 516.8 feet above sea level, and low water of the Ohio at the mouth of Blue River is 359.8 feet above sea level. The other elevations are approximate. The only measured fall is the one over the Wiseman Ripple site from the crest of the White Cloud mill dam to the Congressional Township line. The measured fall there was 53.2 feet. This fall was measured and checked by Mr. Coleman, a civil engineer of New Albany, and again checked by the writer. The approximations cannot be very far from correct.

The Milltown dam could be raised to ten feet without damage to property above. This power could be applied at night for the lighting of Milltown. At present it is not used at night.

The Narrows is a narrow ridge within an incised meander of the river. The fall from the tail race at Milltown to the upper side of the Narrows is approximately 9.5 feet, and the fall on the meander is 5.5 feet. The ridge within the meander is very narrow at one place. It is composed of Mitchell limestone and is 100 feet high. The distance through the ridge at the narrowest place is approximately 400 feet. The distance around the meander at the narrowest place is 1.5 miles. A dam 8.5 feet high at the upper side of the Narrows and a short tunnel would give a fall of 14 feet, 5.5 feet of which would be permanent. The dam would be 250 feet long.

On the Hannell farm the bluffs rise abruptly on each side of the river. The east bluff is terraced, making an excellent location for a power house. The terrace is about fifty feet above the river. The west bluff rises abruptly 150 feet above the river. A ten foot dam could be constructed here without injury to property.

At Babcock's mill site is the remains of an old dam. The power has not been used for about twenty years. The abrupt fall

at this point is 6.9 feet. A dam 14.5 feet high could be constructed here without injury to land above. The dam would be 250 feet long.

The dam at Rothrock's mill could be increased to 14.5 feet with injury to one small bottom field that can be bought for $300.

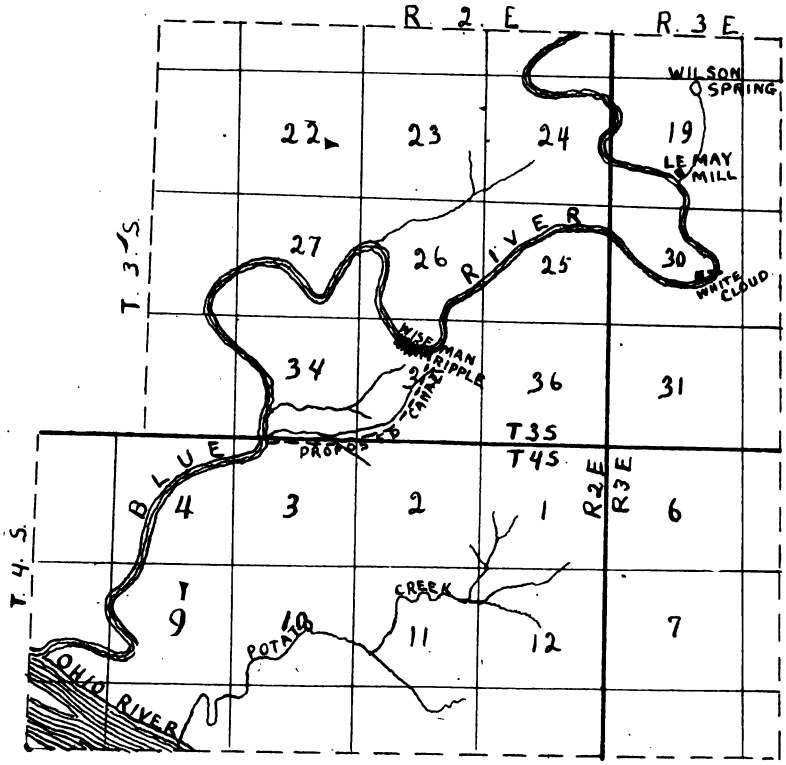
A seven foot dam on the extreme end of the bend below the old Sharp's mill site, and a canal along the west bluff for three-fourths of a mile would produce a fall of fourteen feet, of which seven would be permanent. This dam would not interfere with the power at Rothrock's mill and would injure no property. The cost of constructing the canal would be small, for a gradual hill, uncut by ravines, makes it unnecessary to cut or fill extensively. A wide bottom field occurs between the river and the proposed canal at this place.

Between the tail-race at this place and Le May's mill would be a loss of three feet fall. The cost of constructing any of the proposed powers would be small. The foundation of all dams are in solid rock. There is an abundance of Mitchell limestone at any site. The valley is narrow and the bluffs high.

The drainage from Wilson's spring increases the volume of Blue River considerably. During extreme drought the volume from the spring is almost equal to that of the river above the junction. The spring is more constant than the river, and at ordinary stages furnishes but a small part of the volume. The site at Wiseman's Ripple is below the junction of Wilson's spring branch. In approaching Wiseman's Ripple the river makes a great bend toward the south. Then it makes a great double bend northward and westward below the ripple, and swings far back toward the east at the Congressional Township line between T. 3 S. and T. 4 S., Fig. 3. At this point a small tributary joins the river from the east. The valley of this tributary extends directly across to Wiseman's Ripple. It reduces the south bluff of the river at Wiseman's Ripple to seventy feet. The fall from the crest of the dam at White Cloud to the head of Wiseman's Ripple is 26 feet. The fall from the head of Wiseman's Ripple to the Congressional Township line is 27 feet. A twenty-six foot dam at the head of Wiseman's Ripple with a tunnel one-eighth of a mile long, and a canal one mile long, would produce a fall of fifty-three feet. Twenty-seven feet of this fall would be permanent. Back water from the Ohio occasionally rises on this site. However, whenever this backwater occurs Blue River is also flooded. Reserve wheels could be in-

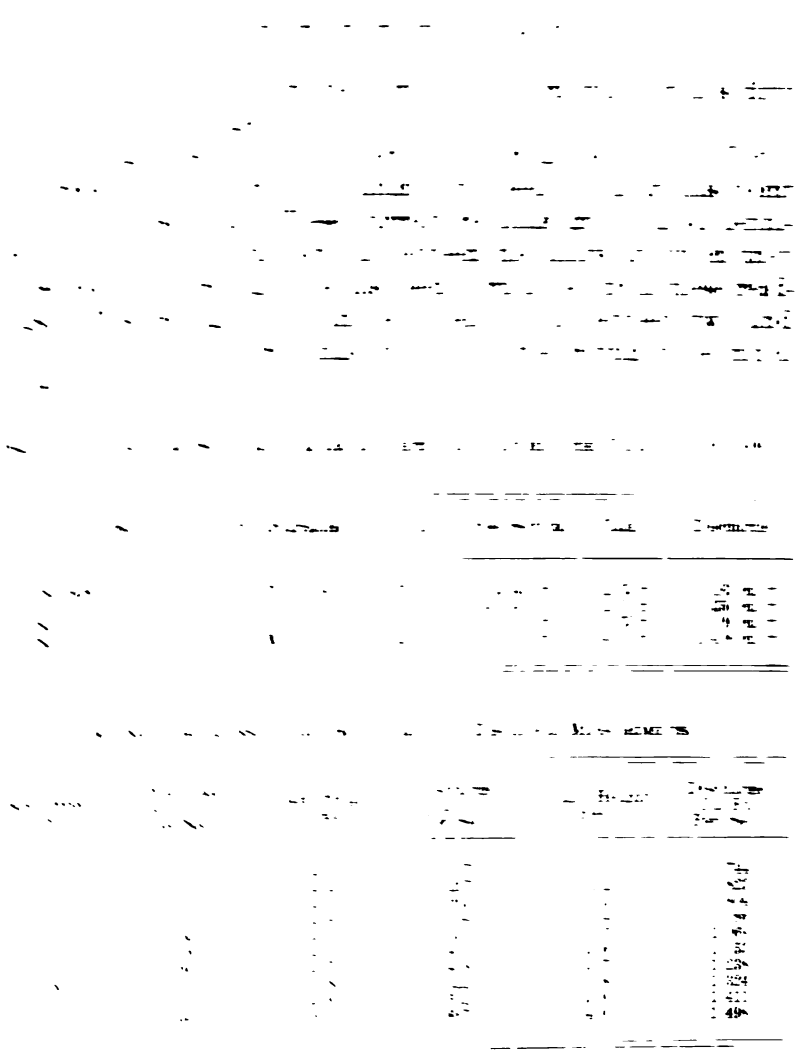
stalled and the loss by backwater overcome by the use of more water.

A gaging station was established one mile above White Cloud near the home of Julius Rothrock on August 18, 1909. The gage is constructed of heavy oak planks securely spiked to a large oak stump, and to the roots of a large sycamore tree. The plank is



MAP OF LOWER BLUE RIVER
SHOWING WISEMAN RIPPLE SITE.
FIG. 3.

placed with the slant of the river bank, which is about thirty degrees. The center is securely supported by heavy oak posts set in the bank. The scale is made of brass headed tacks on the upstream side of the gage. The base of this gage is three feet below a nail in the root of the sycamore tree, to which it is attached, and



[illegible] used, acting 88 cu. ft. for each 1 [illegible] the flow at high gage read-

GAGE READINGS ON BLUE RIVER AT WHITE CLOUD, AUG. 18, 1909, TO AUG. 15, 1910.

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	.....	1.65	1.60	1.70	1.80	1.85	2.70	7.00	2.00	2.70	2.60	2.30	3.10
2	.....	1.65	1.55	1.70	1.90	2.25	2.65	6.20	2.00	2.60	2.60	2.05	2.80
3	.....	1.65	1.55	1.70	2.20	3.05	2.60	4.40	2.05	2.55	2.50	2.15	2.70
4	.....	1.65	1.55	1.70	2.20	2.70	2.60	4.00	2.00	4.00	2.40	2.05	2.40
5	.....	1.60	1.55	1.65	2.20	2.50	2.60	3.70	2.00	3.10	2.70	2.25	2.45
6	.....	1.65	1.50	1.65	2.10	3.20	2.60	3.50	2.05	2.85	2.50	2.90	2.35
7	.....	1.60	1.55	1.60	2.15	2.75	2.50	3.30	2.00	2.80	2.50	7.00	2.30
8	.....	1.65	1.55	1.70	2.30	2.30	2.40	3.15	2.00	5.70	2.35	4.20	2.20
9	.....	1.60	1.60	1.70	2.45	2.30	2.40	3.00	2.00	5.20	2.30	3.40	2.20
10	.....	1.65	1.60	1.80	2.25	2.20	2.40	2.95	2.00	5.00	2.15	3.60	2.15
11	.....	2.40	1.70	1.80	2.25	2.20	2.40	2.80	1.95	3.55	2.30	3.50	2.10
12	.....	2.00	1.70	1.70	3.50	2.30	2.35	2.75	2.00	3.60	2.20	3.70	2.05
13	.....	2.00	1.80	1.75	4.30	2.50	3.30	2.70	3.10	3.95	2.80	4.30	2.00
14	.....	1.80	1.75	1.75	4.80	9.60	2.20	2.65	3.20	3.40	2.60	4.70	2.00
15	.....	1.70	1.70	1.75	3.75	5.20	2.25	2.55	2.80	3.10	2.50	3.65	1.95
16	.....	1.70	1.75	1.70	3.30	4.00	2.30	2.50	2.80	2.95	2.40	3.80	.....
17	.....	1.75	1.70	1.80	3.00	3.55	3.00	2.45	4.90	2.80	2.35	9.00	.....
18	2.05	1.75	2.00	1.80	2.80	4.85	3.10	2.40	4.90	2.90	2 30	5.30	.....
19	1.95	1.75	2.05	1.80	2.60	7.10	2.90	2.35	4.50	2.95	2.25	4.30	.....
20	1.90	1.70	2.10	1.80	2.30	4.55	3.00	2.30	4.80	2.80	2.20	3.60	.....
21	1.60	1.60	2.40	1.95	2.25	4.00	3.30	2.30	4.40	5.10	2.00	3.30	.....
22	1.75	1.65	2.25	1.80	2.25	3.80	5.20	2.30	3.80	3.85	2.05	3.00	.....
23	1.70	1.70	2.25	2.25	2.20	3.60	5.40	2.30	3.50	3.50	2.05	2.85	.....
24	1.70	1.60	2.55	2.25	2.10	3.45	4.60	2.25	3.30	3.30	2.10	2.75	.....
25	1 70	1.60	2.55	2.30	2.10	3.30	3.80	2.20	3.10	4.40	2.00	2.70	.....
26	1.65	1.60	2.20	2.15	2.05	3.10	3.40	2.15	2.95	3.85	2.00	2.80	.....
27	1.65	1.60	2.05	2.00	1.95	3.10	7.10	2.10	2.90	3.40	2.05	2.55	.....
28	1.65	1.55	1.90	2.00	1.90	3.05	12.15	2.10	2.90	3.10	3.25	2.45	.....
29	1.65	1.60	1.90	1.95	2.00	3.00		2.10	2.90	2.90	3.70	3.20	.....
30	1.65	1.55	1.80	1.95	1.90	2.90		2.05	2.80	2.80	2.55	5.15	.....
31	1.70		1.70		1.85	2.80		2.05		2.80		3.60	.....

These gage readings show from the rating table that the minimum discharge during the year was 63 cu. ft. per second. This discharge occurred on October 6. From the time the record was begun until December, the discharge varied from a minimum of 63 cu. ft. per second to a maximum of 304 cu. ft. per second. The average for this time was about 100 cu. ft. per second. For the other eight and a half months the minimum is 113 cu. ft. per second, with only six days that it was below 160 cu. ft. per second. These figures show that for eight months of the year, with a discharge of 160 cu. ft. per second, and a fall of 53 feet, which could be developed on Wiseman's Ripple, a minimum of 771 H. P. (practical) could be produced. For the other four months the minimum would be 303 H. P.

When the gage shows a stage of 2.0 to 2.5 feet the discharge of Wilson's Spring is estimated to be .25 of the entire discharge at this point. This would indicate a minimum discharge of 120 cubic feet per second for the sites above White Cloud for eight months of the year. This discharge at the proposed sites would yield the following minimum power for eight months of the year:

23.7 feet below a nail in the corner of a barn which stands fifty feet south of the gage.

The gage has been read every day during the year by Victor Rothrock. Four current readings have been taken at this point within the last year. These current readings give a good definition of the flow of the stream between the limits at which they were taken. A rating table has been formulated from these readings. This rating table can be depended on between two and four feet. Further readings will make the rating table much more valuable.

DISCHARGE MEASUREMENTS ON BLUE RIVER AT WHITE CLOUD DURING THE YEAR AUG. 18, 1909, TO AUG. 18, 1910.

DATE.	Hydrographer.	Width.	Cross Section.	Gage.	Discharge.
Aug. 18, 1909	W. M. Tucker	153 ft.	333 sq. ft.	2.05 ft.	183 cu. ft.
July 27,1910	W. M. Tucker	157 ft.	416 sq. ft.	2.5 ft.	350 cu. ft.
July 28, 1910	W. M. Tucker	159 ft.	583 sq. ft.	3.55 ft.	1,109 cu. ft.
July 28, 1910	W. M. Tucker	162 ft.	651 sq. ft.	4.0 ft.	1,498 cu. ft.

RATING TABLE CONSTRUCTED FROM FOREGOING DISCHARGE MEASUREMENTS.

Gage Height, Feet.	Discharge, Cu. Ft. Per Sec.	Gage Height, Feet.	Discharge, Cu. Ft. Per Sec.	Gage Height, Feet.	Discharge, Cu. Ft. Per. Sec.
		2.1	197	3.1	744
		2.2	227	3.2	823
		2.3	263	3.3	904
		2.4	304	3.4	986
1.5	63	2.5	350	3.5	1,069
1.6	79	2.6	401	3.6	1.153
1.7	95	2.7	458	3.7	1,238
1.8	113	2.8	522	3.8	1,324
1.9	134	2.9	592	3.9	1,411
2.0	162	3.0	667	4.0	1,498

Above four feet a tangent is used, adding 88 cu. ft. for each .1 foot rise on the gage. This underrates the flow at high gage readings.

GAGE READINGS ON BLUE RIVER AT WHITE CLOUD, AUG. 18, 1909, TO AUG. 15, 1910.

	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	.....	1.65	1.60	1.70	1.80	1.85	2.70	7.00	2.00	2.70	2.60	2.30	3.10
2	.....	1.65	1.55	1.70	1.90	2.25	2.65	6.20	2.00	2.60	2.60	2.05	2.80
3	.....	1.65	1.55	1.70	2.20	3.05	2.60	4.40	2.05	2.55	2.50	2.15	2.70
4	.....	1.65	1.55	1.70	2.20	2.70	2.60	4.00	2.00	4.00	2.40	2.05	2.40
5	.....	1.60	1.55	1.65	2.20	2.50	2.60	3.70	2.00	3.10	2.70	2.25	2.45
6	.....	1.65	1.50	1.65	2.10	3.20	2.60	3.50	2.05	2.85	2.50	2.90	2.35
7	.....	1.60	1.55	1.60	2.15	2.75	2.50	3.30	2.00	2.80	2.50	7.00	2.30
8	.....	1.65	1.55	1.70	2.30	2.30	2.40	3.15	2.00	5.70	2.35	4.20	2.20
9	.....	1.60	1.60	1.70	2.45	2.30	2.40	3.00	2.00	5.20	2.30	3.40	2.20
10	.....	1.65	1.60	1.80	2.25	2.20	2.40	2.95	2.00	5.00	2.15	3.60	2.15
11	.....	2.40	1.70	1.80	2.25	2.20	2.40	2.80	1.95	3.55	2.30	3.50	2.10
12	.....	2.00	1.70	1.70	3.50	2.30	2.35	2.75	2.00	3.60	2.20	3.70	2.05
13	.....	2.00	1.80	1.75	4.30	2.50	3.30	2.70	3.10	3.95	2.80	4.30	2.00
14	.....	1.80	1.75	1.75	4.80	9.60	2.20	2.65	3.20	3.40	2.60	4.70	2.00
15	.....	1.70	1.70	1.75	3.75	5.20	2.25	2.55	2.80	3.10	2.50	3.65	1.95
16	.....	1.70	1.75	1.70	3.30	4.00	2.30	2.50	2.80	2.95	2.40	3.80	.....
17	.....	1.75	1.70	1.80	3.00	3.55	3.00	2.45	4.90	2.80	2.35	9.00	.....
18	2.05	1.75	2.00	1.80	2.80	4.85	3.10	2.40	4.90	2.90	2.30	5.30	.....
19	1.95	1.75	2.05	1.80	2.60	7.10	2.90	2.35	4.50	2.95	2.25	4.30	.....
20	1.90	1.70	2.10	1.80	2.30	4.55	3.00	2.30	4.80	2.80	2.20	3.60	.....
21	1.60	1.60	2.40	1.95	2.25	4.00	3.30	2.30	4.40	5.10	2.00	3.30	.....
22	1.75	1.65	2.25	1.80	2.25	3.80	5.20	2.30	3.80	3.85	2.05	3.00	.....
23	1.70	1.70	2.25	2.25	2.20	3.60	5.40	2.30	3.50	3.50	2.05	2.85	.....
24	1.70	1.60	2.55	2.25	2.10	3.45	4.60	2.25	3.30	3.30	2.10	2.75	.....
25	1.70	1.60	2.55	2.30	2.10	3.30	3.80	2.20	3.10	4.40	2.00	2.70	.....
26	1.65	1.60	2.20	2.15	2.05	3.10	3.40	2.15	2.95	3.85	2.00	2.80	.....
27	1.65	1.60	2.05	2.00	1.95	3.10	7.10	2.10	2.90	3.40	2.05	2.55	.....
28	1.65	1.55	1.90	2.00	1.90	3.05	12.15	2.10	2.90	3.10	3.25	2.45	.....
29	1.65	1.60	1.90	1.95	2.00	3.00		2.10	2.90	2.90	3.70	3.20	.....
30	1.65	1.55	1.80	1.95	1.90	2.90		2.05	2.80	2.80	2.55	5.15	.....
31	1.70		1.70		1.85	2.80		2.05		2.80		3.60	.....

These gage readings show from the rating table that the minimum discharge during the year was 63 cu. ft. per second. This discharge occurred on October 6. From the time the record was begun until December, the discharge varied from a minimum of 63 cu. ft. per second to a maximum of 304 cu. ft. per second. The average for this time was about 100 cu. ft. per second. For the other eight and a half months the minimum is 113 cu. ft. per second, with only six days that it was below 160 cu. ft. per second. These figures show that for eight months of the year, with a discharge of 160 cu. ft. per second, and a fall of 53 feet, which could be developed on Wiseman's Ripple, a minimum of 771 H. P. (practical) could be produced. For the other four months the minimum would be 303 H. P.

When the gage shows a stage of 2.0 to 2.5 feet the discharge of Wilson's Spring is estimated to be .25 of the entire discharge at this point. This would indicate a minimum discharge of 120 cubic feet per second for the sites above White Cloud for eight months of the year. This discharge at the proposed sites would yield the following minimum power for eight months of the year:

Station.	Fall.	Discharge.	Power.
Milltown	10 feet	120 cu. ft.	109 H. P.
Narrows	14 feet	120 cu. ft.	152 H. P.
Hannels	10 feet	120 cu. ft.	109 H. P.
Babcock's	14.5 feet	120 cu. ft.	158 H. P.
Rothrock's	14.5 feet	120 cu. ft.	158 H. P.
Sharp's	14 feet	120 cu. ft.	152 H. P.
Le May's	8 feet	40 cu. ft.	29 H. P.
Wiseman's	53 feet	160 cu. ft.	771 H. P.
Total			1,638 H. P.

WHITE RIVER SYSTEM.

White River drains the south central portion of Indiana. Its basin comprises more than a third of the area of the State. It rises in central and southeastern Indiana by numerous branches which unite to form two main branches. The general direction of the drainage is toward the southwest. The east and west forks unite at the southwest corner of Daviess County. The main stream flows from this point to the Wabash River at Mt. Carmel, Illinois. The drainage area of the whole system is approximately 11,300 sq. mi. The drainage areas of the east and the west forks are approximately equal, each 5,550 sq. mi. Tributaries to the main stream below the junction drain approximately 200 sq. mi.

The East Fork of White River rises along the crest of the Niagara escarpment in Henry, Fayette, Rush, Decatur, Ripley and Jefferson Counties. The tributaries from this escarpment are long streams with slight fall. The largest tributary is known as Blue River, in Henry, Rush and Shelby Counties. It rises in the Wisconsin glacial area, which it leaves in Bartholomew County. It then flows for a short distance in the Illinois glacial area and enters the unglaciated region in Jackson County. It flows directly across the unglaciated region and re-enters the Illinois glacial area, in Daviess County, in which it continues to its mouth. The Wisconsin glacial deposits at the source of this stream tend to regulate the flow so that it never ceases, even in northern Rush County, where the stream is very small. A long valley train of glacial material occurs in Bartholomew and Jackson Counties, diminishing in Lawrence and Martin Counties. This valley train covers the underlying strata and leaves few bed rock dam sites. This stream flows across every rock formation of the State except the Ordovician, but only occasionally is bed rock exposed in the river bed. These exposures occur where the stream meanders into one of its bluffs.

The valley of the East Fork of White River is everywhere broad and level. It is an excellent farming region. Frequent floods occur which cover the lowland for great distances. During these floods the river often makes radical changes in its course. The loose sand and gravel of which the bed of the stream is composed is easily shifted by the flood water. Gradual changes are constantly going on whereby the stream in time entirely changes its course. These conditions hinder the installation of water power stations.

The rainfall in White River basin is very near the average of the State. Several observation stations are located in the basin, and the mean average of these stations for the last ten years shows slightly more than 39.5 inches. If this were all carried away by the river the continuous discharge of each fork would the 16,150 cu. ft. per second. These figures mean nothing as they stand, but if the actual discharge during the ten years could be known the difference between rainfall and runoff in the valley could be determined. In 1904 the U. S. G. S. took daily gage readings and careful current readings at Shoals. The mean discharge in second-feet for that year is given in Water Supply and Irrigation Paper No. 128, page 95, as 4,640 cu. ft. The mean annual rainfall in the East Fork of White River basin for that year was 39 inches. The drainage area above Shoals is 4,900 sq. mi. If all this water were carried away it would represent a discharge of 14,078 cu. ft. per second. Since the actual discharge was only 4,640 second feet, we find that the discharge is 32.96 per cent. of the rainfall. One year is not sufficient to make a definite determination of this relation. The government records have not been kept at Shoals for any full year except 1904 and 1905. The government statistics will be given here verbatim.

WHITE RIVER (EAST BRANCH), AT SHOALS, IND.[6]

This station was established June 25, 1903, by A. C. Lootz. It is located at the highway bridge, in the village of Shoals, Ind., 400 feet above the Baltimore and Ohio Southwestern Railroad bridge. There are rapids just below this station and also about 5½ miles below. The gage is read once each day by O. H. Greist. The standard chain gage is fastened to the railing and metal posts of the downstream side of the first span on the left end of the highway bridge. The length of the chain from the end of the weight to the marker is 46.41 feet. This gage was established to take the

[6] Water Supply and Irrigation Paper, No. 98, pp. 216–218.

place of the original vertical gage, which was fastened to one of the piers. Discharge measurements are made from the 3-span highway bridge to which the gage is attached. The initial point for soundings is the face of the left abutment. The channel is straight above and below the station and the current is swift. The right bank is a high rocky road embankment, and never overflows; the left bank is a steep rocky bluff and does not overflow. The bed of the stream is rocky, and the channel is divided into three parts by the bridge piers. Bench mark No. 1 is the stone cap on the downstream end of the first pier from the left bank. Its elevation is 100 feet above gage datum.

The observations of this station during 1903 have been made under the direction of E. Johnson, jr., district hydrographer.

DISCHARGE MEASUREMENTS OF WHITE RIVER (EAST BRANCH) AT SHOALS, INDIANA IN 1903.

DATE.	Hydrographer.	Gage Height. Feet.	Discharge. Second-feet.
une 22	A. C. Lootz		*2,000
August 4	L. R. Stockman	65.07	3,392
September 4	L. R. Stockman	63.40	511

*Float measurements.

MEAN DAILY GAGE HEIGHT, IN FEET, OF WHITE RIVER (EAST BRANCH) AT SHOALS, INDIANA, FOR 1903.

DAY.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		64.50	63.60	63.50	63.40	63.50	63.70
2		64.40	64.70	63.50	63.40	63.50	63.70
3		64.30	64.80	63.50	63.40	63.50	63.70
4		64.10	65.30	63.50	63.50	63.50	63.60
5		64.00	66.10	63.50	63.50	63.50	63.60
6		64.20	66.90	63.50	63.50	63.50	63.50
7		64.20	66.80	63.50	63.60	63.50	63.50
8		64.10	66.00	63.50	63.70	63.50	63.50
9		64.10	65.50	63.50	63.80	63.50	63.60
10		64.10	65.10	63.50	63.90	63.50	63.60
11		64.00	64.90	63.50	63.90	63.50	63.50
12		64.00	64.60	63.50	63.90	63.50	63.50
13		63.90	64.40	63.50	64.00	63.50	63.50
14		63.90	64.10	63.50	64.00	63.50	63.50
15		63.80	64.10	63.50	63.90	63.50	63.50
16		63.80	64.00	63.40	63.90	63.50	63.50
17		63.80	64.00	63.40	63.80	63.50	63.50
18		63.90	64.00	63.40	63.70	63.70	63.50
19		63.80	63.90	63.40	63.70	63.70	63.50
20		63.70	63.90	63.40	63.60	63.70	63.60
21		63.70	63.90	63.40	63.60	63.80	64.10
22		63.50	63.80	63.40	63.50	63.90	64.20
23		63.50	63.80	63.40	63.50	64.00	64.20
24		63.50	63.70	63.40	63.50	63.90	64.50
25		63.50	63.70	63.40	63.50	63.80	64.60
26		63.50	63.70	63.40	63.50	63.70	64.90
27	64.30	63.50	63.60	63.40	63.50	63.70	65.20
28	64.30	63.60	63.60	63.40	63.50	63.60	65.00
29	64.40	63.60	63.60	63.40	63.50	63.60	65.00
30	64.50	63.60	63.50	63.40	63.50	63.70	64.80
31		63.60	63.50		63.50		64.60

RATING TABLE FOR WHITE RIVER (EAST BRANCH) AT SHOALS, INDIANA, FROM JUNE 22 TO DECEMBER 31, 1903.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
63.4	510	64.7	2,600	67.0	6,970	69.6	11,910
63.5	640	64.8	2,790	67.2	7,350	69.8	12,290
63.6	770	64.9	2,980	67.4	7,730	70.0	12,670
63.7	910	65.0	3,170	67.6	8,110	70.5	13,620
63.8	1,050	65.2	3,550	67.8	8,490	71.0	14,570
63.9	1,200	65.4	3,930	68.0	8,870	71.5	15,520
64.0	1,350	65.6	4,310	68.2	9,250	72.0	16,470
64.1	1,510	65.8	4,690	68.4	9,630	72.5	17,420
64.2	1,680	66.0	5,070	68.6	10,010	73.0	18,370
64.3	1,860	66.2	5,450	68.8	10,390	73.5	19,320
64.4	2,045	66.4	5,730	69.0	10,770	74.0	20,270
64.5	2,230	66.6	6,210	69.2	11,150		
64.6	2,415	66.8	6,590	69.4	11,530		

Table made from measurements of August 4 and September 24, 1903, and January 24, 1904. Table should be accurate to limiting height in 1903.

DISCHARGE MEASUREMENTS OF WHITE RIVER (EAST BRANCH) AT SHOALS, IND., IN 1904.[7]

DATE.	Hydrographer.	Width, Feet.	Area of Section, Sq. Ft.	Mean Vol., Ft. per Sec.	Gage Height, Ft.	Discharge, Sec. Ft.
January 24	F. W. Hanna	.....	4,105	4.61	73.47	19,010
March 5	F. W. Hanna	375	2,321	4.99	68.64	11,590
March 30	F. W. Hanna	427	13,410	6.00	95.20	79,820
May 5	F. W. Hanna and Johnson	356	1,124	3.72	65.43	4,180
June 16	F. W. Hanna	349	789	2.30	64.53	1,812
July 28	F. W. Hanna	307	515	1.60	63.88	823
August 24	F. W. Hanna	295	379	1.28	63.32	484
September 15	F. W. Hanna	295	373	1.06	63.24	397
October 20	F. W. Hanna	295	371	1.07	63.23	396
November 3	F. W. Hanna	288	324	.99	63.17	320

[7] Water Supply and Irrigation Paper, No. 128, pp. 93-95.

Day.	Jan.*	Feb.*	Mar.*	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.†
1	64.6	66.2	67.6	91.0	67.0	64.8	65.3	63.8	63.3	63.5	63.2	63.2
2	64.5	65.5	68.1	88.8	66.5	65.6	65.1	63.7	63.3	63.5	63.2	63.2
3	64.3	65.2	68.2	87.2	65.9	66.0	65.0	63.7	63.3	63.5	63.2	63.2
4	64.2	64.9	68.7	85.6	65.6	66.0	64.8	63.7	63.3	63.4	63.2	63.2
5	64.1	64.8	68.6	84.4	65.4	65.6	64.7	63.7	63.3	63.4	63.2	63.2
6	64.1	68.5	69.1	83.4	65.3	65.4	64.5	63.7	63.2	63.3	63.2	63.2
7	64.1	71.5	72.3	80.2	65.1	65.0	64.4	63.7	63.2	63.3	63.2	63.2
8	64.0	72.8	72.9	73.2	65.0	64.9	64.3	63.7	63.2	63.3	63.2	63.2
9	64.0	74.3	71.5	68.4	64.9	64.7	64.3	63.7	63.2	63.3	63.2	63.2
10	64.0	76.1	70.3	67.7	64.8	64.6	64.3	63.6	63.3	63.3	63.2	63.2
11	64.0	77.0	70.5	67.5	64.7	64.5	64.4	63.6	63.3	63.3	63.2	63.2
12	64.0	76.0	69.8	67.3	64.7	64.4	64.5	63.6	63.3	63.3	63.2	63.2
13	64.0	72.5	69.1	67.0	64.7	64.4	64.5	63.5	63.3	63.3	63.2	63.2
14	64.0	68.5	68.9	66.8	64.6	64.3	64.5	63.5	63.3	63.3	63.2	63.2
15	64.0	66.5	68.7	66.5	64.6	64.4	64.4	63.5	63.3	63.3	63.2	63.0
16	64.0	66.0	68.0	66.2	64.5	64.3	64.5	63.5	63.2	63.3	63.2	63.0
17	64.0	65.9	67.6	66.0	64.5	64.5	64.3	63.5	63.2	63.3	63.2	63.1
18	64.0	65.6	67.5	65.8	66.5	64.6	64.2	63.5	63.4	63.3	63.2	63.1
19	64.1	65.4	67.6	65.6	66.5	64.7	64.2	63.5	63.7	63.3	63.2	63.2
20	64.1	65.2	67.7	65.4	64.5	64.9	64.2	63.5	63.6	63.3	63.2	63.2
21	64.6	65.1	67.7	65.3	64.5	64.9	64.2	63.6	63.5	63.3	63.2	63.2
22	69.4	67.3	68.0	65.2	64.5	64.9	64.2	63.6	63.5	63.2	63.2	63.2
23	73.3	68.3	74.4	65.1	64.6	64.8	64.2	63.6	63.4	63.2	63.2	63.2
24	73.5	69.6	75.2	65.1	64.7	64.8	64.1	63.5	63.4	63.2	63.2	63.3
25	74.2	70.9	78.4	65.2	64.6	64.8	64.1	63.4	63.4	63.2	63.2	63.4
26	74.5	70.6	87.1	66.5	64.6	64.8	64.0	63.4	63.7	63.2	63.2	63.9
27	74.8	69.4	87.7	67.5	64.8	64.8	64.0	63.3	63.8	63.2	63.2	64.5
28	75.0	68.0	92.8	68.6	64.6	65.2	63.9	63.3	63.8	63.2	63.2	65.2
29	72.2	67.3	95.0	68.4	64.6	64.8	63.9	63.3	63.7	63.2	63.2	66.0
30	67.8		94.9	67.8	64.6	65.4	63.8	63.3	63.5	63.2	63.2	66.3
31	66.5		93.4		64.7		63.8	63.3		63.2		66.0

*Ice conditions January, February and March uncertain.

†Frozen December 15 to 31.

Rating Table for White River (East Branch) at Shoals, Ind., from January 1 to December 31, 1904.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
63.0	215	64.7	2,000	67.4	8,110	76.0	30,030
63.1	286	64.8	2,150	67.6	8,610	77.0	32,630
63.2	360	64.9	2,310	67.8	9,110	80.0	40,430
63.3	440	65.0	2,470	68.0	9,610	83.0	48,230
63.4	520	65.1	2,640	68.5	10,860	84.0	50,830
63.5	605	65.2	2,820	69.0	12,110	85.0	53,430
63.6	695	65.3	3,010	69.5	13,360	87.0	58,630
63.7	790	65.4	3,210	70.0	14,610	88.0	61,230
63.8	890	65.6	3,640	70.5	15,860	90.0	66,430
63.9	990	65.8	4,110	71.0	17,110	91.0	69,030
64.0	1,100	66.0	4,610	71.5	18,360	92.0	71,630
64.1	1,210	66.2	5,110	72.0	19,630	93.0	74,230
64.2	1,330	66.4	5,610	72.5	20,930	94.0	76,830
64.3	1,450	66.6	6,110	73.0	22,230	95.0	79,430
64.4	1,580	66.8	6,610	73.5	23,530		
64.5	1,710	67.0	7,110	74.0	24,830		
64.6	1,850	67.2	7,610	75.0	27,430		

The above table is applicable only for open-channel conditions. It is based upon 13 discharge measurements made during 1903 and 1904. It is well defined between gage heights 63.2 and 65.4 feet.

Above gage heights 72 feet the rating curve is a tangent, the difference being 260 per tenth. Two flood measurements above 65.4 feet gage height define the tangent. The table has been extended beyond these limits.

DISCHARGE MEASUREMENTS OF EAST BRANCH OF WHITE RIVER AT SHOALS, IND., 1905.[8]

DATE.	Hydrographer.	Width, Feet.	Area of Section, Square Feet.	Mean Velocity, Feet per Second.	Gage Height, Feet.	Discharge, Second-Feet.
March 16	S. K. Clapp	355	1,421	4.28	66.00	6,090
May 15	M. S. Brennan	406	4,248	4.26	73.58	18,120
June 15	S. K. Clapp	330	744	2.47	64.40	1,838
October 16	M. S. Brennan	313	564	1.74	63.80	982

DAILY GAGE HEIGHT, IN FEET, OF EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FOR 1905.

DAY.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	65.5	63.9	66.4	66.0	67.0	66.4	64.3	63.8	65.1	63.9	65.6	66.3
2	65.0	64.0	68.4	66.0	67.2	66.8	64.2	63.8	65.6	64.0	65.4	69.0
3	64.7	63.8	67.9	65.9	67.5	66.4	64.1	63.8	65.0	64.0	65.3	70.0
4	64.5	63.8	68.0	65.6	67.0	65.8	64.1	63.7	64.7	64.1	65.2	71.0
5	64.3	63.7	68.1	65.3	65.8	65.4	64.0	63.6	64.3	64.1	66.0	70.8
6	64.3	63.7	67.1	65.0	66.1	65.2	64.0	63.6	64.2	64.3	66.5	69.3
7	64.1	63.7	66.7	64.9	67.0	65.9	64.0	63.5	64.2	64.5	66.5	68.4
8	63.9	63.7	67.1	64.8	67.3	64.9	64.0	63.6	64.0	64.6	66.8	67.0
9	63.7	63.7	70.6	64.7	67.5	64.9	63.9	63.7	64.0	64.6	67.0	66.5
10	63.6	63.8	71.5	64.5	68.0	65.0	63.9	63.7	64.0	64.4	66.7	65.6
11	63.6	63.9	71.7	65.1	68.8	64.9	64.0	63.8	64.2	64.2	66.2	65.4
12	65.5	64.0	70.0	65.3	69.6	64.8	64.2	64.0	64.2	64.1	65.8	65.2
13	65.5	64.2	68.9	65.4	71.6	64.6	64.3	64.1	64.1	64.0	65.5	65.2
14	66.4	64.4	67.2	65.4	72.8	64.5	64.3	64.8	64.1	63.9	65.2	65.1
15	66.0	64.5	66.4	65.2	74.0	64.4	64.2	66.2	64.2	63.8	65.2	65.0
16	65.7	64.6	66.0	65.0	75.2	64.3	64.2	65.7	64.2	63.8	65.0	64.9
17	66.8	64.4	65.8	64.8	76.2	64.3	64.2	66.1	64.2	64.0	64.9	64.8
18	67.2	64.2	65.5	64.6	75.3	64.3	64.1	66.1	64.1	65.3	64.8	64.7
19	65.8	64.0	65.4	64.5	72.3	64.3	64.0	66.0	64.0	69.1	64.8	64.8
20	65.2	63.9	65.2	64.4	69.7	64.8	64.0	66.7	64.0	71.1	64.8	65.0
21	64.7	64.2	65.2	64.6	67.4	65.0	63.9	66.1	64.2	69.4	64.9	65.8
22	64.5	65.0	65.1	66.6	66.4	65.4	63.9	65.9	64.3	69.8	65.0	67.0
23	64.4	65.2	65.0	67.7	66.0	65.6	64.0	65.8	64.3	68.7	64.9	68.2
24	63.8	66.0	65.0	68.7	65.6	65.8	64.4	66.0	64.1	67.3	64.8	68.4
25	63.8	67.1	65.0	67.5	65.4	65.4	64.4	66.0	64.0	67.0	64.7	68.5
26	63.8	70.3	65.0	67.0	65.2	65.1	64.3	65.9	63.9	68.0	64.7	67.9
27	63.9	71.6	65.0	66.9	65.1	64.9	64.3	65.7	63.8	67.9	64.7	66.9
28	64.0	68.2	65.7	66.4	65.0	64.7	64.2	65.4	63.8	68.0	64.9	66.5
29	64.0		65.2	66.2	64.9	64.6	64.0	65.3	63.8	67.3	65.1	66.0
30	64.0		65.6	66.4	65.0	64.4	63.9	65.2	63.8	66.6	65.8	65.9
31	63.9		66.0		65.0		63.8	64.9		66.0		65.8

[8] Water Supply and Irrigation Paper, No. 169, pp. 87–88.

STATION RATING TABLE FOR EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FROM JANUARY 1 TO DECEMBER 31, 1905.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
63.50	570	65.40	4,041	67.30	8,390	70.40	15,520
63.60	670	65.50	4,266	67.40	8,620	70.60	15,980
63.70	790	65.60	4,492	67.50	8,850	70.80	16,440
63.80	918	65.70	4,718	67.60	9,080	71.00	16,900
63.90	1,050	65.80	4,945	67.70	9,310	71.20	17,360
64.00	1,190	65.90	5,172	67.80	9,540	71.40	17,820
64.10	1,338	66.00	5,400	67.90	9,770	71.60	18,280
64.20	1,500	66.10	5,630	68.00	10,000	71.80	18,740
64.30	1,673	66.20	5,860	68.20	10,460	72.00	19,200
64.40	1,856	66.30	6,090	68.40	10,920	72.50	20,350
64.50	2,051	66.40	6,320	68.60	11,380	73.00	21,500
64.60	2,259	66.50	6,550	68.80	11,840	73.50	22,700
64.70	2,479	66.60	6,780	69.00	12,300	74.00	23,900
64.80	2,700	66.70	7,010	69.20	12,760	74.50	25,100
64.90	2,922	66.80	7,240	69.40	13,220	75.00	26,300
65.00	3,145	66.90	7,470	69.60	13,680	75.50	27,500
65.10	3,365	67.00	7,700	69.80	14,140	76.00	28,700
65.20	3,592	67.10	7,930	70.00	14,600	76.50	29,900
65.30	3,816	67.20	8,160	70.20	15,060		

NOTE.—The above table is applicable only for open channel conditions. It is based on 14 discharge measurements made during 1903–1905. It is fairly well defined between gage heights 63.2 feet, and 69 feet. The table has been extended beyond these limits, being based on one measurement at 95.2 feet. This measurement may be considerably in error owing to backwater.

DISCHARGE MEASUREMENTS OF EAST BRANCH OF WHITE RIVER AT SHOALS, IND., IN 1906.[1]

Date.	Hydrographer.	Width, Feet.	Area of Section, Sq. Ft.	Gage Height, Feet.	Discharge, Sec. Ft.
February 15*	Brennan & Kriegsman	341	943	64.90	2,550
March 1	E. F. Kriegsman	331	967	65.08	3,200
March 29	E. F. Kriegsman	406	4,390	74.01	20,000
April 2	E. F. Kriegsman	430	9,400	85.62	37,800
April 15	E. F. Kriegsman	353	2,510	69.30	12,400

*Thin ice running.

DAILY GAGE HEIGHT, IN FEET, OF EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FOR 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	65.8	65.5	65.2	84.5	65.0	64.3	17	70.0	64.7	67.1	69.3	64.4	64.0
2	66.2	65.4	65.1	86.0	65.0	64.3	18	69.8	64.7	66.7	68.8	64.4	63.9
3	67.8	65.3	67.1	87.4	65.0	64.2	19	69.5	64.7	66.7	67.8	64.3	63.9
4	76.4	65.2	69.0	88.0	64.9	64.2	20	69.2	64.6	67.0	67.0	64.3	63.9
5	75.0	65.0	70.8	87.5	64.9	65.1	21	68.0	64.7	68.1	66.7	64.3	63.8
6	73.5	64.8	70.2	85.7	65.0	64.8	22	67.6	64.9	69.7	66.4	64.3	63.8
7	73.0	64.6	68.8	82.8	65.1	64.7	23	67.9	65.5	69.8	66.0	64.3	63.9
8	72.5	64.3	67.4	77.0	65.0	64.5	24	67.7	65.9	69.7	65.8	64.3	63.8
9	71.3	64.3	66.3	73.2	64.8	64.5	25	67.5	65.8	69.7	65.7	64.2	63.8
10	69.5	64.4	66.6	72.0	64.7	64.7	26	67.1	65.5	70.0	65.6	64.2	63.8
11	67.8	64.5	66.6	71.0	64.6	64.6	27	66.7	65.3	70.7	65.4	64.2	63.8
12	66.6	64.7	66.6	70.5	64.4	64.4	28	66.3	65.2	73.7	65.3	64.2	63.8
13	66.4	64.7	66.6	70.0	64.5	64.3	29	66.0		74.4	65.2	64.1	63.8
14	66.2	64.7	66.7	69.8	64.5	64.2	30	65.8		78.2	65.1	64.1	63.8
15	67.5	64.7	66.9	69.5	64.5	64.1	31	65.6		82.5		64.1	
16	69.1	64.8	67.0	69.2	64.4	64.0							

NOTE.—Slight ice conditions during part of February, but flow was not probably much affected thereby.

[1] Water Supply and Irrigation Paper, No. 205, p. 69.

RATING TABLE FOR EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FOR 1905 AND 1906.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
63.80	880	65.00	2,920	66.20	6,360	67.80	9,700
63.90	1,000	65.10	3,180	66.30	6,580	68.00	10,080
64.00	1,130	65.20	3,460	66.40	6,800	68.20	10,400
64.10	1,270	65.30	3,750	66.50	7,020	68.40	10,840
64.20	1,410	65.40	4,050	66.60	7,240	68.60	11,220
64.30	1,560	65.50	4,360	66.70	7,460	68.80	11,590
64.40	1,720	65.60	4,670	66.80	7,680	69.00	11,950
64.50	1,890	65.70	4,980	66.90	7,900	70.00	13,750
64.60	2,070	65.80	5,280	67.00	8,100	71.00	15,400
64.70	2,260	65.90	5,580	67.20	8,500	72.00	17,000
64.80	2,460	66.00	5,860	67.40	8,900	73.00	18,500
64.90	2,680	66.10	6,120	67.60	9,300	74.00	20,000

NOTE.—The above table applicable only for open channel conditions. It is based on discharge measurements made during 1903 to 1906. It is well defined between gage heights 63.2 feet and 65 4 feet. Above gage height 72.0 feet the rating curve is tangent, the difference being 150 per tenth.

The following measurement was made October 12, 1908:[10] Width, 275 feet; area, 331 sq. ft.; gage height, 63.2 feet; discharge, 345 second-feet.

DAILY GAGE HEIGHT, IN FEET, OF EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FOR 1908.

Day.	May.	June.	Aug.	Oct.	Nov.	Dec.	Day.	May.	June.	Aug.	Oct.	Nov.	Dec.
1	.....	65.5	.....	.....	63.2	63.4	17	69.7	64.5	.....	63.2	63.2	63.3
2	67.4	65.5	.....	.....	63.2	63.4	18	67.4	64.4	.....	63.2	63.2	63.3
3	67.8	65.4	.....	.....	63.2	63.4	19	66.7	64.4	.....	63.2	63.2	63.3
4	68.0	65.3	.....	.....	63.2	63.4	20	66.5	64.3	.....	63.2	63.2	63.3
5	77.5	65.2	.....	.....	63.2	63.3	21	66.3	64.3	.....	63.2	63.2	63.3
6	81.8	65.0	.....	.....	63.2	63.3	22	66.2	64.2	.....	63.2	63.2	63.3
7	83.8	64.9	.....	.....	63.2	63.3	23	66.0	64.2	.....	63.2	63.2	63.3
8	85.6	64.8	.....	.....	63.2	63.3	24	66.0	64.2	.....	63.2	63.3	63.3
9	87.1	64.9	.....	.....	63.2	63.3	25	65.7	64.6	.....	63.2	63.2	63.3
10	87.9	64.8	.....	.....	63.2	63.3	26	65.5	64.6	.....	63.2	63.3	63.3
11	88.2	64.7	.....	.....	63.2	63.3	27	65.4	64.4	.....	63.2	63.4	63.3
12	88.2	64.7	.....	63.2	63.2	63.3	28	65.3	64.3	.....	63.2	63.5	63.3
13	87.5	64.7	64.8	63.2	63.2	63.3	29	65.4	64.2	.....	63.2	63.4	63.3
14	85.9	64.6	.....	63.2	63.2	63.3	30	65.4	64.1	.....	63.2	63.4	63.3
15	82.6	64.6	.....	63.2	63.2	63.3	31	65.5			63.2		63.3
16	76.6	64.5	.....	63.2	63.2	63.3							

RATING TABLE FOR EAST BRANCH OF WHITE RIVER AT SHOALS, IND., FOR 1906 to 1908.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
63.20	340	65.00	2,920	66.20	6,360	67.80	9,700
63.30	410	65.10	3,180	66.30	6,580	68.00	10,080
63.40	490	65.20	3,460	66.40	6,800	68.20	10,400
63.50	580	65.30	3,750	66.50	7,020	68.40	10,840
63.60	670	65.40	4,050	66.60	7,240	68.60	11,220
63.70	770	65.50	4,360	66.70	7,460	68.80	11,590
64.40	1,720	65.60	4,670	66.80	7,680	69.00	11,950
64.50	1,890	65.70	4,980	66.90	7,900	70.00	13,750
64.60	2,070	65.80	5,280	67.00	8,100	71.00	15,400
64.70	2,260	65.90	5,580	67.20	8,500	72.00	17,000
64.80	2,460	66.00	5,860	67.40	8,900	73.00	18,500
64.90	2,680	66.10	6,120	67.60	9,300	74.00	20,000

[10] Water Supply and Irrigation Paper, No. 243, p. 102.

During the time for which these statistics have been kept, the smallest discharge occurred on December 15 and 16, 1904. At this time the gage registered 63 feet, and the discharge was 215 cu. ft. per second. This period was the result of the drouth, which occurred in October, November and December of that year. The rainfall preceding this low discharge had been less than three inches in two and one-half months. It is unfortunate that the gage was not read during the months of July, August and September, 1908, which were unusually dry months. However, such periods are of rare occurrence, and a larger discharge than 215 cu. ft. per second can be relied upon for eleven and a half months of the dryest years at Shoals. During the time that the gage has been kept, there have been but six days on which the discharge was less than 340 cu. ft. per second. These days were December 15, 16, 17, 18, 1904, and October 12 and 23, 1908.

Another gage has been in operation at Tannehill bridge for the year December 7, 1909, to December 6, 1910. Tannehill bridge is situated on Blue River, one mile west of Taylorville, in Bartholomew County. The gage is located on the downstream face of the east abutment of the bridge. The base of the gage is mean low water mark. This gage was installed by R. T. Cooke, who owned the power site, and was kept by Mr. Jay, who lives near the bridge. The current readings were made by Mr. Cooke. The writer made two current readings with Mr. Cooke, and finds by the rating curve that Mr. Cooke's readings are accurate in every respect.

DISCHARGE MEASUREMENTS ON EAST FORK OF WHITE RIVER AT TANNEHILL BRIDGE, 1910.

DATE.	Hydrographer.	Gage Height.	Discharge.
March 27	R. T. Cooke	.8 feet	575 cu. ft.
March 31	Cooke & Tucker	.7 feet	532.42 cu. ft.
April 13	R. T. Cooke	.5 feet	453.09 cu. ft.
May 19	R. T. Cooke	.275 feet	307.09 cu. ft.
May 29	R. T. Cooke	.825 feet	674.42 cu. ft.
June 2	R. T. Cooke	.525 feet	491.94 cu. ft.
June 7	R. T. Cooke	.425 feet	390.90 cu. ft.
June 12*	R. T. Cooke	.45 feet	421.83 cu. ft.
June 12	R. T. Cooke	.45 feet	416.37 cu. ft.
June 14	R. T. Cooke	.4 feet	363.11 cu. ft.
June 26	R. T. Cooke	.175 feet	223.01 cu. ft.
July 26	R. T. Cooke	1.05 feet	836.19 cu. ft.
July 29	Cooke & Tucker	.825 feet	638.63 cu. ft.

*This measurement was made by float system.

GAGE READINGS ON EAST FORK OF WHITE RIVER AT TANNEHILL BRIDGE, FROM DECEMBER 7, 1909, TO DECEMBER 6, 1910, INCLUSIVE.

DAY.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.7	1.3	10.5	.6	.6	.6	.65	.6	.35	.2	.55	1.1
2	.....	.8	1.2	13.5	.6	.55	.6	.5	.7	.3	.15	.5	1.05
3	.....	1.1	1.0	10.5	.55	.85	.55	.4	.5	.2	.1	.65	.9
4	.....	2.0	1.1	7.9	.7	2.45	.5	.35	.45	.15	.1	.6	.75
5	.....	1.7	1.2	6.1	.7	2.3	.5	.4	.4	.1	2.5	.55	.7
6	.....	1.9	1.3	4.9	.7	1.6	.5	1.0	.35	.3	8.2	.55	.65
7	.5	2.0	1.1	4.1	.7	1.2	.5	.9	.35	1.1	10.9	.55	.....
8	.8	2.0	.9	3.4	.7	1.2	.5	.8	.3	.85	12.0	.5	.....
9	.9	1.9	.8	2.8	.65	1.1	.45	.7	.3	.6	8.9	.5	.....
10	.6	1.2	.8	2.4	.6	1.0	.45	.6	.25	.5	5.7	.5	.....
11	1.1	1.0	.7	2.2	.6	.85	.4	.6	.2	.35	3.8	.5	.....
12	7.0	.8	.6	1.8	.55	.95	.45	.65	.2	.25	2.9	.5	.....
13	5.7	2.1	.6	1.7	.5	1.1	.45	.8	.15	.2	2.3	.45	.....
14	7.1	8.0	.5	1.6	.5	1.05	.4	1.2	.15	.15	1.9	.45	.....
15	7.1	9.8	.5	1.4	.5	.9	.35	1.6	.15	.15	1.6	.45	.....
16	5.5	8.4	.6	1.2	.6	.9	.35	2.1	.12	.15	1.45	.45	.....
17	3.4	5.1	1.1	1.1	.6	.75	.4	7.3	.05	.1	1.3	.45	.....
18	1.5	7.6	2.8	.95	.7	.7	.2	10.4	.05	.05	1.1	.4	.....
19	1.8	9.5	1.8	1.05	.8	.75	.25	7.4	.05	.1	1.0	.4	.....
20	1.3	8.6	1.7	1.2	.95	.7	.25	4.7	.05	.25	.95	.4	.....
21	1.1	7.6	1.6	1.1	1.1	.75	.45	2.9	.05	.5	.95	.4	.....
22	1.0	5.7	1.9	1.15	1.1	1.9	.25	2.1	.02	.45	.85	.4	.....
23	.9	4.0	2.6	1.0	1.05	2.25	.22	51.7	.0	.35	.85	.35	.....
24	.9	2.9	3.2	1.0	.85	1.95	.22	51.45	.1	.3	.8	.35	.....
25	.8	2.5	2.4	.9	.8	1.6	.2	1.4	.4	.25	.85	.35	.....
26	.7	2.2	2.1	.85	.7	1.3	.3	1.2	.3	.25	.85	.35	.....
27	.7	2.0	1.9	.9	.7	1.0	.27	1.0	.37	.25	.75	.4	.....
28	.8	1.8	4.2	.8	.7	.85	.25	1.0	.4	.2	.65	.75	.....
29	.8	2.4		.7	.65	.7	1.85	1.0	.4	.25	.65	1.2	.....
30	.7	1.9		.75	.6	.7	.9	.7	.4	.2	.55	1.3	.....
31	.6	1.5		.6		*		.7	.45		.55		.....

*No record.

STATION RATING TABLE FOR EAST FORK OF WHITE RIVER AT TANNEHILL BRIDGE FOR DECEMBER 7, 1909 TO DECEMBER 6, 1910.

Gage Height, Feet.	Discharge, Cu. Ft.	Gage Height, Feet.	Discharge, Cu. Ft.	Gage Height, Feet.	Discharge, Cu. Ft.
0.0	130	0.5	436	1.0	772
0.1	185	0.6	480	1.1	886
0.2	243	0.7	522	1.2	1,000
0.3	305	0.8	580	1.3	1,114
0.4	372	0.9	660		

During the year for which these gage readings have been kept the smallest discharge occurred on August 23, 1910; the discharge at this time was 130 cu. ft. per second. On sixty-two days during the year the discharge was below 372 cu. ft. per second. During these days the gage registered less than .4 of a foot.

PROFILE OF EAST FORK OF WHITE RIVER.

STATION.	Distance Apart, Miles.	Distance from Morristown, Miles.	Elevation, Feet.
Morristown	0	0	815
Edinburg	50	50	652
Columbus	21	71	602
Rockford	25	96	556
Medora	30	126	505
Rivervale	40	166	479
Shoals	50	216	450
Junction, W. Fork	58	274	400
Mouth, White River	50	324	376

POWER SITES ON EAST FORK OF WHITE RIVER.

The writer traversed the East Fork of White River from Columbus to the junction with the West Fork, and the Muscatatuck branch from Vernon to its junction with the main branch near Medora, in Jackson County. On this branch there is no power worthy of note. In the upper course above the junction with the Graham fork there is an insufficient flow to warrant development. Below the junction the stream bed is deeply filled with alluvium and the fall is exceedingly slight. The flow on this branch is very irregular. This is due to the lack of forest or glacial deposits at the head waters of the tributaries. The tributaries rise on the Niagara limestone and have bed rock beds. The whole Muscatatuck basin is approaching maturity in the cycle of erosion, and hence drains quickly into the streams. Thus heavy floods occur in rainy weather, and during dry seasons the streams practically cease to flow. An interesting old mill site occurs on this stream at Vernon. It was known as the Old Tunnel mill. A tunnel was constructed in the early part of the last century through the limestone and shale, at the neck of the large incised meander west of Vernon. This tunnel is about 200 feet long. The meander of the stream from the upper to the lower end of the tunnel is 2.5 miles. A small dam below the upper end of the tunnel turned the water through the tunnel, and twenty-six feet fall was produced. This was used on a large undershot wheel. The power was used for grinding flour until 1896. The flood in November of that year backed water into the lower story of the stone mill and the south wall fell out and crushed the wheel. The mill was never rebuilt. This power was supplemented by steam power which it was necessary to employ during dry seasons.

MAIN BRANCH OF EAST FORK.

This stream has not been thoroughly investigated above Columbus, but several powers on this part of the stream have been visited.

CARTHAGE, RUSH COUNTY.

A small power plant is in operation at Carthage in northwest Rush County. Blue River is dammed at a point 300 feet above the Big Four railroad bridge. The dam is built of timber five feet high. It is built on a foundation of sand and gravel. Glacial boulders have been placed below the dam to break the force of the overflow. A canal leads from the south end of the dam to the power plant one mile down the valley. The canal skirts the bluff on the southeast side of the stream, while the river makes a wide detour along the west bluff. The plant is thus located a quarter of a mile from the river. It is also situated twenty feet above low water mark on the river. Extreme high water floods the basement of the plant, but does not get above the first floor. Thus the canal serves the double purpose of removing the plant from the immediate vicinity of the river, and of making it possible to locate the plant above flood stage. However, little advantage is taken of the increased head of water. The fall on the wheel is but six feet. This could be increased to fifteen or eighteen feet by deepening the tail race to the river. This would yield about 100 horse-power.

One thirty-seven inch wheel is used which produces forty horse-power. During dry seasons the supply of water is insufficient for continuous use. During ordinary stage of water the power is used day and night. It is employed by the Cox & Cox Milling Company during the day and by the Carthage Light Company during the night. This power is owned by Cox & Cox Milling Company, Carthage, Indiana.

MORRISTOWN, SHELBY COUNTY.

Two miles north of Morristown, on the farm of O. W. Righter, is the site of a water power which was formerly used by a flour mill. The mill is now gone and only the remnants of the dam and race remain. The dam was constructed of wood and glacial boulders. The canal is similar to the one at Carthage. It skirts the east bluff of the river for half a mile, but the mill was located on the river bank below. This power could be restored with a fall of nine feet. On this fall a power of sixty horse-power could be

produced, except in dry weather. This power is owned by O. W. Righter, of Carthage, Indiana.

FREEPORT, SHELBY COUNTY.

A well improved small power plant is in operation at Freeport. An excellent stone dam 5.5 feet high has recently been erected. The dam is 250 feet long. The power is used for grinding purposes. The mill is located on the west end of the dam. Three wheels are in operation. A thirty-six inch wheel is employed, which produces ten horse-power. This is used for shelling and grinding corn. A forty-eight inch wheel produces fifteen horse-power, which is used for crushing corn. A fifty-inch wheel produces twenty horse-power, which is used to run the flour mill. These wheels are not all employed at the same time. The power referred to each of these wheels is the amount used. None of them are used to their full capacity. Each wheel is capable of producing about twice the power employed. This power is owned and employed by H. Balting, Freeport, Indiana.

EDINBURG, INDIANA.

One of the best dams in the state is located at Edinburg. It is a stone and cement dam, and was built in 1884 by John Thompson, who then owned the site. The power was used in Mr. Thompson's large flour mill. It has not been in use for several years.

The dam is 225 feet long and seven feet high. A short race increased the head to eight feet. Both race and dam are in good repair. The flow here is approximately half the flow at Tannehill bridge, which is eight miles down the river. According to the data taken within the past year, the discharge at this point would be 65 cu. ft. per second at a minimum, and of 186 feet per second for nine months in the year. This discharge on the eight foot fall would yield 135 horse-power (practical), which is 80 per cent. of the absolute power.

TANNEHILL BRIDGE.

This power site is located one mile west of Taylorville, Bartholomew County. The power has been used in former times and the mill, dam and race are still in fair repair. The dam is constructed of brush and poles. It is 5.5 feet high. The race is one-fourth mile long and the fall at the wheel was 8 1-3 feet. From the year's data at this point the minimum discharge is 185 cu. ft. per second. For only 62 days during the year did the discharge fall below 340

cu. ft. This would produce a minimum of 140 horse-power on the 8 1-3 feet fall, or 257.5 horse-power, when the discharge was 340 cu. ft. per second.

For four miles from Tannehill to Lowell the fall in the river is heavy. From the crest of the dam at Tannehill bridge to the foot of the ripple at Lowell is a fall of 19.2 feet. The conditions for building a canal along the east bluff of the river between these two points are ideal. The soil is a clay and the bluff is very little dissected by valley tributaries to the river. A dam twenty feet high could be constructed at the point where the present dam stands. The river at this point is 140 feet wide, and the dam would be 400 feet long. The canal could be extended along the east bluff to Lowell, and there a fall of 33.7 feet would be realized. If two feet were deducted from this for canal flow, the actual fall would be 31.7 feet. The minimum flow of 185 cu. ft. per second on 31.7 feet fall would produce a practical power of 533 H. P., and with a discharge of 340 cu. ft. a power of 979.8 H. P. would be produced. The Indianapolis, Columbus and Southern Traction Company have control of this power site.

Below Columbus there is no developed power. The fall in this part of the river is very slight. No abrupt fall occurs, except in the vicinity of Shoals. However, several small power stations could be installed in this part of the river. There is an occasional exposure of rock in the bed of the river, which would form an excellent foundation for a dam.

Such an exposure occurs under the Pennsylvania Railroad bridge at Rockford, three miles north of Seymour, in Jackson County, section 31, T. 7 N., R. 6 E. This exposure is at the base of the knobstone. The stone is Rockford goniatite limestone. It is but two feet thick, and is of little use for dam construction. However, the bed rock forms an excellent site for a dam. The river is 200 feet wide. The east bank is near the bluff, which rises gradually to the upland. The west bank is about thirty feet in height, and the wide valley occurs beyond it. A head of 15 feet could be procured at this point.

Another outcrop of rock occurs about four hundred feet below the mouth of Muscatatuck in Washington County, section 22, T. 4 N., R. 2 E. The river sweeps into the south bluff exposing the knobstone shale. This shale forms the bottom of the river at this point. The south bank is the river bluff, which rises 200 feet or more above the river. It is composed entirely of soft, thin bedded

knobstone shale. The north bank is about twenty-five feet in height, and beyond it is the broad valley. The river makes an abrupt bend on this exposure and is 200 feet wide. A head of 15 feet could be procured at this point.

At Lawrenceport, in Lawrence County, section 27, T. 4 N., R. 1 E., is an old dam site. A dam was first built here in 1850, and the present dam was abandoned in 1890. The head used was 6 feet. The south end of the dam is in an exposure of Harrodsburg limestone. The dam still remains except near the center, where it was blown out by government employes. The river is here 200 feet wide. Good exposures of Harrodsburg and Salem limestone occur here, which are excellent concrete and building stone. A head of 10 feet could be produced at this point.

WILLIAMS, INDIANA.

A power site is now being developed at Williams in western Lawrence County. At this point the river bed is in river deposit. The work of construction has begun since this part of the river was investigated by the writer. Hence, it is not known whether excavation to bed rock was possible at this point or not. The river here flows near the north bluff. The banks are about forty feet high above low water. The dam under construction is to give a head of seventeen feet. This will produce some storage in the channel, because the fall in the river above this point is very small. The back water will probably reach sixteen or seventeen miles. This site is about twenty-three miles above Shoals, and if the discharge be considered the same as at Shoals the minimum power for the time records have been kept at Shoals can be computed. The minimum discharge at Shoals during this time was 215 cu. ft. per second on December 15 and 16, 1904. On a head of seventeen feet this discharge would produce 332 horse-power. However, if 340 cu. ft. per second be considered available, 525 horse-power can be produced regularly. High stages of the water will interfere with this power by lowering the head. A twenty foot stage of the river will practically eliminate the head. The particular advantage of this site is in the height of the river banks. They will retain a twenty foot stage above the dam in the immediate vicinity of the dam.

The power from this point will be used at Bedford and in the quarry district about Bedford.

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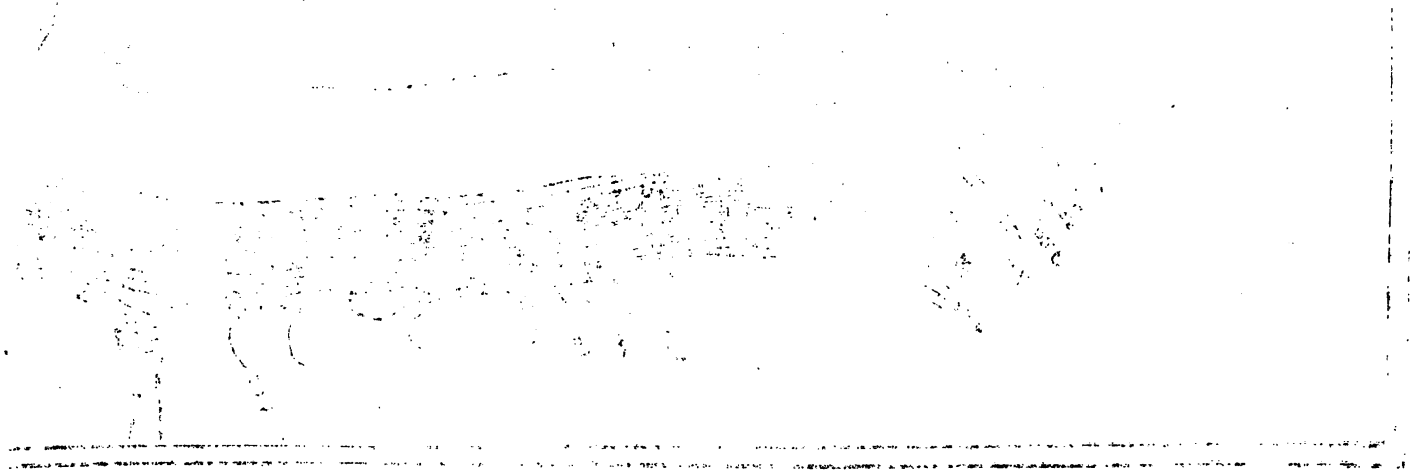


SHOALS, INDIANA.

The most favorable power site on the East Fork of White River is at Shoals, Martin County, Sec. 30, T. 3 N., R. 1 W., where the river flows over an exposure of Mansfield sandstone. This stone forms the bed of the river for several hundred feet above and below the B. & O. bridge. The river is very rapid at this point. It is 375 feet in width. A fall of approximately 6 feet occurs within the mile on the great bend at Shoals.

A line of levels from near the point where the B. & O. R. R. begins to parallel the river west of West Shoals, and a point near the Pinnacle showed a fall of 5.86 feet, when the river was 4.1 feet above low water mark. The fall would be increased if the river were nearer the low water mark. This fall has been measured by other parties, one of which found it to be 7.92. The fall in ordinary stage of water is approximately 6 feet. The river bed between the Pinnacle and the B. & O. R. R. bridge is of Mansfield sandstone, and forms an excellent foundation for a dam.

Two plans for developing this power have been suggested upon careful investigation of the topography of the region. It is found that the height of the dam at the point indicated on the map, Fig. 4. should not exceed ten feet because of injury by overflow to low lying lands above. Such a dam could be cheaply and easily built at this point. It is then necessary to conduct the water across the meander to a point at the foot of the fall where an abrupt fall of 16 feet would be obtained. Two routes for this channel are indicated on map, Fig. 4. A canal along route A would be easily constructed. The excavation would be entirely in alluvium and the depth would nowhere be great, as shown by the map. This route, however, presents certain difficulties, which are overcome in route B. The whole system, except a short distance near the middle, would be below flood stage of the river. This would increase the cost of maintaining a canal. The power house must also be in low land, which would increase the cost of constructing it. This canal would be about one mile in length.

A canal along route B would penetrate the hill at a point above the Pinnacle, where two small tributaries to the river have well begun the work. One of these tributaries has cut a gorge on the west side of the hill, while the other has cut a gorge on the east side directly opposite. The entire canal would be excavated in Mansfield sandstone, except a short distance at each end. About 650 feet would have to be tunneled. The cost of constructing this

White River (West Branch), at Indianapolis, Ind.[11]

This station was established May 6, 1904, by E. Johnson, Jr., assisted by F. W. Hanna. It is located in the central portion of the city on the bridge of the Cleveland, Cincinnati, Chicago and St. Louis Railway. A standard chain gage is attached to the down stream side of the bridge, the scale being graduated to feet and tenths on the down stream side of the binding tie. The length of the chain from the end of the weight to the marker, which is outside the ring, is 37.10 feet. The gage is read twice each day by J. D. Burk. The chain and weight are kept at the water softening plant of the Kingan Packing Company, located one hundred feet down stream from the right abutment of the bridge. Discharge measurements are made from the down stream side of the through Pratt truss bridge of three spans, to which the gage is attached. The initial point for sounding is the down stream inner face of the right abutment. The channel is straight for about 500 feet above and for 1,000 feet below the station. The current is direct, but sluggish in low stages. The right bank is moderately high and seldom overflows. The left bank is high, covered by buildings, and never overflows. All the water passes between the abutments of the bridge. The bed of the stream is composed of gravel and sand, and is fairly permanent. There are three channels at all stages. At low water the current is too sluggish to permit of very accurate measurement. Bench mark No. 1 is the south capstone of the ballast wall of the right abutment. Its elevation is 36.51 feet above the datum of the gage. Bench mark No. 2 is the down stream top edge of the fifth cross-girder from the right abutment of the bridge. Its elevation is 36.54 feet above the datum of the gage.

The observations at this station during 1904 have been made under the direction of E. Johnson, Jr., District Hydrographer.

Discharge Measurements of White River (West Branch) at Indianapolis, Ind., in 1904.

Date.	Hydrographer.	Width, Feet.	Area of Section, Sq. Feet.	Mean Velocity, Ft. per Sec.	Gage Height, Feet.	Discharge, Sec.-Ft.
May 6	Johnson & Hanna	265	1,423	0.81	8.80	1,147
June 17	F. W. Hanna	256	1,324	.65	8.45	866
July 29	F. W. Hanna	222	1,129	.34	7.53	380
August 23	F. W. Hanna	233	1,210	.41	7.85	495
September 14	F. W. Hanna	223	1,042	.23	7.20	240
October 21*	F. W. Hanna	68	150	1.43	7.30	216
November 4*	F. W. Hanna	68	131	1.49	7.20	195

*Measurement made from boat and cable one mile below station.

[11] Water Supply and Irrigation Paper, No. 128, pp. 89–90.

MEAN DAILY GAGE HEIGHT, IN FEET, OF WHITE RIVER (WEST BRANCH) AT INDIANAPOLIS, IND., IN 1904.

DAY.	Mar.*	Apr.*	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		18.85		8.90	8.30	7.50	7.30	7.40	7.20	7.10
2		21.66		9.50	8.45	7.45	7.30	7.10	7.20	7.10
3		20.90		9.20	8.35	7.40	7.30	7.30	7.20	7.10
4		14.71		9.10	8.25	7.40	7.20	7.30	7.20	7.10
5				9.10	8.20	7.40	7.20	7.30	7.20	7.10
6			8.80	8.75	8.20	7.35	7.25	7.25	7.20	7.10
7			8.75	8.60	9.10	7.35	7.30	7.25	7.20	7.10
8			8.70	8.40	9.50	7.35	7.30	7.20	7.20	6.75
9			8.70	8.30	9.45	7.30	7.25	7.20	7.30	6.70
10			8.70	8.30	9.20	7.30	7.20	7.20	7.25	7.10
11			8.60	8.20	8.90	7.40	7.20	7.50	7.20	7.10
12			8.50	8.20	8.70	7.30	7.20	7.50	7.20	7.10
13			8.50	8.10	8.50	7.25	7.20	7.40	7.20	7.10
14			8.40	8.10	8.40	7.20	7.25	7.40	7.10	6.90
15			8.40	8.00	8.20	7.15	7.20	7.30	7.20	6.95
16			8.40	8.10	8.10	7.20	7.20	7.30	7.20	7.00
17			8.40	8.50	8.00	7.20	7.20	7.30	7.20	7.15
18			8.50	8.50	8.00	7.10	7.25	7.30	7.20	7.15
19			8.70	8.70	7.90	7.20	7.30	7.30	7.20	7.10
20			8.90	9.10	7.90	7.50	7.55	7.30	7.20	7.10
21			9.10	9.60	7.85	7.80	7.35	7.30	7.20	7.10
22			9.10	9.60	8.00	8.20	7.30	7.30	7.20	7.10
23			8.80	9.00	8.00	8.00	7.30	7.30	7.20	7.20
24			8.70	8.90	7.85	7.65	7.30	7.30	7.20	7.50
25			8.70	8.55	7.80	7.60	7.40	7.25	7.20	7.60
26	21.42		8.60	8.45	7.70	7.40	7.70	7.25	7.20	7 70
27	24.74		8.70	8.40	7.65	7.35	7.60	7.25	7.20	9.20
28	21.21		8.70	8.30	7.60	7.30	7.60	7.20	7.10	9.70
29	13.79		8.80	8.30	7.55	7.30	7.60	7.10	7.10	8.75
30	12.15		8.80	8.30	7.50	7.25	7.60	7.15	7.10	8.45
31	13.26		8.90		7.50	7.30		7.15		8.50

*Readings March 26 to April 4 reduced from readings of Kingan gage.

RATING TABLE FOR WHITE RIVER (WEST BRANCH) AT INDIANAPOLIS, IND., FROM MAY 6 TO DECEMBER 31, 1904.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
7.0	184	7.7	425	8.4	840
7.1	211	7.8	475	8.5	910
7.2	240	7.8	525	8.6	990
7.3	271	8.0	580	8.7	1,070
7.4	304	8.1	640	8.8	1,150
7.5	340	8.2	700	8.9	1,240
7.6	380	8.3	770	9.0	1,330

The above table is applicable only for open channel conditions. It is based upon seven discharge measurements made during 1904. It is well defined between gage heights 7.2 feet and 8.8 feet. The table has been extended beyond these limits.

DISCHARGE MEASUREMENTS OF THE WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., IN 1905.[12]

DATE.	Hydrographer.	Width Feet.	Area of Section Sq. Ft.	Mean Velocity, Ft. per Sec.	Gage Height, Feet.	Discharge, Sec.-Ft.
March 15	S. K. Clapp	250	1,415	1.00	8.80	1,408
May 13	M. S. Brennan	328	2,836	3.04	13.30	8,626
June 14	S. K. Clapp	243	1,277	.57	8.05	730
September 11	M. S. Brennan	272	1,452	.98	8.98	1,427
October 18	M. S. Brennan	239	1,234	.50	7.94	621

[12] Water Supply and Irrigation Paper, No. 169, pp. 83–84.

DAILY GAGE HEIGHT, IN FEET, OF WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., FOR 1905.

DAY.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	8.5	7.3	11.8	10.6	10.4	11.0	7.6	7.3	7.8	7.7	7.75	8.3
2.....	8.3	7.2	12.1	9.8	9.4	9.8	7.6	7.3	7.7	8.35	7.7	8.4
3.....	8.15	7.1	11.2	9.3	9.0	9.3	7.65	7.35	7.6	10.3	7.7	8.8
4.....	7.65	7.1	10.8	8.9	8.75	8.8	7.65	7.3	7.7	10.7	7.65	9.9
5.....	7.85	7.15	10.1	8.75	8.6	8.5	7.6	7.3	7.8	9.6	7.9	8.2
6.....	7.85	7.15	9.6	8.5	8.65	8.7	7.6	7.3	7.75	9.0	8.4	8.4
7.....	7.8	7.1	9.4	8.4	9.0	8.8	7.6	7.75	7.65	8.6	9.7	8.6
8.....	7.55	7.1	9.6	8.2	9.2	8.9	7.6	7.65	7.6	8.3	9.35	8.3
9.....	7.4	7.2	10.2	8.15	8.95	8.5	7.8	7.6	7.5	8.2	8.9	8.15
10.....	7.35	7.15	10.7	8.1	8.7	8.3	8.0	7.6	7.6	8.15	8.5	8.1
11.....	7.5	7.15	9.8	10.3	8.9	8.2	7.85	7.5	7.85	8.0	8.3	8.0
12.....	8.1	7.15	9.5	10.2	13.2	8.2	7.8	7.5	11.1	7.95	8.15	7.95
13.....	8.8	7.1	9.1	10.0	13.3	8.2	8.2	7.65	11.5	8.0	8.1	7.9
14.....	8.9	6.95	8.9	9.3	12.5	7.95	8.2	7.85	9.8	7.9	8.0	7.85
15.....	8.7	7.0	8.75	8.85	11.1	8.0	8.0	8.2	9.0	7.85	7.95	7.7
16.....	8.25	7.0	8.9	8.6	10.4	7.9	7.85	8.65	9.1	7.8	7.85	7.65
17.....	8.2	7.1	8.6	8.4	10.0	7.95	7.7	8.8	11.7	7.7	7.8	7.65
18.....	8.2	7.1	8.75	8.3	9.8	7.9	7.7	8.6	12.0	7.9	7.8	7.6
19.....	8.1	7.2	8.8	8.2	9.5	7.9	7.6	8.5	10.8	8.25	7.75	7.6
20.....	8.0	7.2	8.9	8.3	9.2	7.95	7.55	8.3	9.6	9.15	7.7	7.65
21.....	7.95	7.25	8.95	10.1	9.0	8.2	7.55	8.3	9.3	9.1	7.6	7.75
22.....	7.9	7 35	8.8	11.9	8.7	8.4	7.5	8.9	8.8	8.85	7.6	9.9
23.....	7.75	7.55	8.65	11.8	8.5	8.3	7.55	8.5	8.5	8.6	7.55	10.5
24.....	7.7	8.0	8.6	10.4	8.35	8.1	7.55	8.2	8.3	8.3	7.5	10.1
25.....	7.3	9.7	9.1	9.6	8.2	8.0	7.5	8.6	8.2	8.15	7.5	9.5
26.....	7.2	10.9	9.1	9.3	8.15	7.9	7.5	9.9	8.0	8.0	7.5	8.95
27.....	7.4	11.7	8.8	9.2	8.1	7.65	7.45	9.6	7.9	8.0	7.5	8.6
28.....	7.5	11.4	8.55	9.2	8.0	7.6	7.35	8.9	7.85	7.9	7 65	8.4
29.....	7.35		8.5	9.4	8.3	7.6	7.3	8.5	7.85	7.8	7.7	8.35
30.....	7.3		9.5	10.4	12.4	7.6	7.3	8.15	7.75	7.75	7.9	8.5
31.....	7.35		11.0		12.2		7.3	7.9		7.8		8.6

NOTE.—Ice conditions unknown: discharge applied as for open channel.

STATION RATING TABLE FOR WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., FROM JANUARY 1 TO DECEMBER 31, 1905.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
6.9	125	8.2	800	9.4	1,895	11.2	4,315
7.0	150	8.3	880	9.5	2,005	11.4	4,655
7.1	180	8.4	960	9.6	2,115	11.6	5,005
7.2	215	8.5	1,045	9.7	2,225	11.8	5,375
7.3	255	8.6	1,130	9.8	2,345	12.0	5,765
7.4	300	8.7	1,215	9.9	2,465	12.2	6,165
7.5	350	8.8	1,305	10.0	2,585	12.4	6,585
7.6	400	8.9	1,395	10.2	2,815	12.6	7,015
7.7	455	9.0	1,490	10.4	3,125	12.8	7,455
7.8	515	9.1	1,585	10.6	3,405	13.0	7,905
7.9	580	9.2	1,685	10.8	3,695	13.5	9,055
8.0	650	9.3	1,785	11.0	3,995	14.0	10,210
8.1	725						

NOTE.—The above table is applicable only for open channel conditions. It is based on 10 discharge measurements made during 1904–5. It is well defined between gage heights 7.2 feet and 9 feet. The table has been extended beyond these limits, being based on one measurement at 13.3 feet.

DISCHARGE MEASUREMENTS OF WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., IN 1906.[18]

DATE.	Hydrographer.	Width, Feet.	Area of Section, Sq. Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
February 14	Brennan & Kriegsman	227	1,160	7.80	765
February 28	E. F. Kriegsman	221	1,200	8.00	1,000
March 30	E. F. Kriegsman	331	3,050	13.64	10,500
March 31	E. F. Kriegsman	331	3,700	16.00	18,000
June 9	E. F. Kriegsman	226	1,110	7.78	643

DAILY GAGE HEIGHT, IN FEET, OF WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., FOR 1906.

DAY	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	8.45	8.5	7.95	16.45	7.85	8.75	7.1
2	8.25	8.3	8.3	14.55	7.8	8.6	7.1
3	8.5	7.9	8.8	12.4	7.8	8.4	7.1
4	10.6	7.85	9.3	11.15	7.75	7.9	7.4
5	11.85	7.7	9.45	10.7	7.8	8.2	7.15
6	10.85	7.55	9.0	10.35	7.7	8.0	7.25
7	9.7	7.6	8.55	10.0	7.65	8.0	7.2
8	8.2	7.5	8.5	9.9	7.6	7.85	7.15
9	8.3	7.6	8.6	12.5	7.55	7.8	7.1
10	8.2	7.55	8.8	13.0	7.55	7.7	7.1
11	8.3	7.55	8.95	12.0	7.6	7.65	7.15
12	8.5	7.6	9.2	11.0	7.55	7.5	7.4
13	8.4	7.6	9.45	10.4	7.55	7.45	7.15
14	8.25	7.65	9.4	10.75	7.5	7.45	7.05
15	8.35	7.75	9.35	11.55	7.45	7.4	7.05
16	9.5	7.85	9.1	11.35	7.3	7.35	7.1
17	10.1	7.6	9.3	10.4	7.3	7.3	7.05
18	9.9	7.6	9.45	9.8	7.35	7.3	7.05
19	9.4	7.65	9.5	9.4	7.5	7.25	7.05
20	9.1	7.7	9.2	9.1	7.4	7.25	7.05
21	8.8	7.8	8.9	8.9	7.4	7.25	6.95
22	11.1	7.9	8.8	8.75	7.35	7.35	.....
23	12.0	7.95	8.65	8.55	7.4	7.3	.....
24	11.35	8.0	8.5	8.45	7.4	7.3	.....
25	10.5	8.2	8.45	8.3	7.4	7.25	.....
26	9.7	8.4	8.35	8.2	7.35	7.15	.....
27	9.3	8.35	14.7	8.15	7.35	7.15	.....
28	9.0	8.0	15.45	8.0	7.5	7.1	.....
29	8.9		15.6	7.95	7.4	7.1	.....
30	8.8		13.6	7.9	7.35	7.2	.....
31	8.6		16.25		7.65		.....

NOTE.—Discharge probably unaffected by ice conditions.

[18] Water Supply and Irrigation Paper, No. 205, pp. 66–67.

RATING TABLE FOR WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND., FOR 1906.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
6.9	240	8.2	1,080	9.5	2,420	11.6	5,820
7.0	280	8.3	1,170	9.6	2,540	11.8	6,230
7.1	325	8.4	1,260	9.7	2,670	12.0	6,650
7.2	375	8.5	1,350	9.8	2,800	12.2	7,090
7.3	430	8.6	1,450	9.9	2,930	12.4	7,540
7.4	490	8.7	1,550	10.0	3,070	12.6	8,000
7.5	550	8.8	1,650	10.2	3,350	12.8	8,470
7.6	615	8.9	1,750	10.4	3,650	13.0	8,950
7.7	680	9.0	1,850	10.6	3,970	14.0	11,570
7.8	750	9.1	1,960	10.8	4,310	15.0	14,570
7.9	830	9.2	2,070	11.0	4,670	16.0	18,000
8.0	910	9.3	2,180	11.2	5,040	16.5	19,830
8.1	990	9.4	2,300	11.4	5,420		

NOTE.—The above table is applicable only for open channel conditions. It is based on five discharge measurements made during 1906 and on the form of the 1905 rating curve. It is not very well defined.

During the time the records have been kept at this station, the lowest discharge of 1904 occurred on December 8, 9, 14 and 15. The gage at this time registered less than 7.0 feet, and the discharge was less than 184 cu. ft. per second. An equally low stage of the river occurred in February, 1905, when for twenty days the discharge was 180 cu. ft. per second or less. The lowest stage in 1906 occurred on the last day of which the record was taken. At that time the discharge was 260 cu. ft. per second.

LOWER EEL RIVER AT CATARACT, INDIANA.[14]

This station was established August 6, 1903, by E. Johnson, Jr., assisted by L. R. Stockman. It is located six miles from Cloverdale, Ind., and one-half mile southwest of Cataract, Ind. It is 300 feet above a dam, below which there is a fall of 35 feet The gage is a 3 by 6 inch oak timber, securely fastened to the west abutment on the down stream face. It is marked by brass-headed nails and reads from zero to 10 feet. The gage is read once each day by Joe Steiner. Discharge measurements are made from the upstream side of the single-span, covered highway bridge, which has a length between abutments of 128 feet. The initial point for soundings is the face of the left or west abutment at the coping on the upstream side. Distances are marked by wire nails and painted figures on the guard rail on the upstream side of the bridge. The channel is straight for about 500 feet above and 300 feet below the bridge. The current varies from swift to rather sluggish. Both banks are high and rocky and will not overflow.

[14] Water Supply and Irrigation Paper, No. 98, pp. 218-219.

The bed of the stream is a smooth rock ledge, nearly level between the bridge abutments.

Bench mark No. 1 is a wire nail in the root of a small elm tree on the north side of the road approaching the bridge on the west side of the river about 50 feet from the bridge. Its elevation above the zero of the gage is 12.60 feet. Bench mark No. 2 is a wire nail in the root of a large oak tree in the pasture on the west of the river 300 feet from the bridge and 20 feet from the fence which bounds the south side of the road approaching the bridge. The elevation of this bench mark is 27.20 feet above the zero of the gage.

The observations at this station during 1903 have been made under the direction of E. Johnson, Jr., district hydrographer.

DISCHARGE MEASUREMENT OF LOWER EEL RIVER AT CATARACT IN 1903.

DATE.	Hydrographer.	Gage Height, Feet.	Discharge, Sec.-Ft.
August 6	E. Johnson, Jr.	2.60	1,479
August 12	E. Johnson, Jr.	1.30	127
September 25	L. R. Stockman	1.04	14
March 24, 1910	W. M. Tucker	1.25	50.25*

*This discharge measurement was made as a check on the measurements made in 1903 and was found to fit the curve very closely. A rating table was then formulated from these four measurements. This rating table follows the 1909–10 gage readings. It is not very well defined, but should be accurate up to 2.6 feet.

MEAN DAILY GAGE HEIGHT, IN FEET, OF LOWER EEL RIVER AT CATARACT, IND., FOR 1903.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.	DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.20	1.10	1.20	1.30	17	1.15	1.35	1.20	1.30	1.30
2	.....	1.15	1.10	1.20	1.25	18	1.20	1.30	1.20	1.30	1.30
3	.....	1.15	1.10	1.20	1.30	19	1.10	1.30	1.15	1.30	1.40
4	.....	1.20	1.30	1.20	1.30	20	1.10	1.15	1.20	1.30	1.60
5	.....	1.15	1.20	1.20	1.30	21	1.10	1.15	1.30	1.30	1.60
6	2.60	1.00	1.30	1.20	1.30	22	1.10	1.25	1.20	1.20	1.60
7	2.00	1.00	2.50	1.20	1.35	23	1.10	1.20	1.20	1.25	1.60
8	1.55	1.00	2.70	1.20	1.35	24	1.10	1.20	1.20	1.20	1.60
9	1.50	1.00	2.20	1.00	1.35	25	1.10	1.15	1.20	1.30	1.60
10	1.40	1.00	2.10	1.20	1.35	26	1.10	1.15	1.20	1.30	1.60
11	1.35	1.00	1.20	1.20	1.40	27	1.10	1.10	1.20	1.25	1.40
12	1.30	1.00	1.15	1.30	1.40	28	1.05	1.15	1.20	1.20	1.40
13	1.20	1.10	1.15	1.40	1.30	29	1.20	1.10	1.15	1.30	1.40
14	1.20	1.10	1.15	1.30	1.30	30	1.15	1.05	1.20	1.30	1.40
15	1.20	1.15	1.60	1.30	1.30	31	1.20		1.20		1.40
16	1.15	1.30	1.30	1.30	1.30						

One measurement was made on May 4, 1904; gage height, 1.28 feet; discharge, 140 sec. ft.[15]

[15] Water Supply and Irrigation Paper, No. 128, pp. 91–92.

MEAN DAILY GAGE HEIGHT, IN FEET, OF LOWER EEL RIVER NEAR CATARACT, IND., FOR 1904.

DAY.	Jan.*	Feb.*	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1....	1.60	2.40	3.50	4.80	2.00	1.40	1.40	0.90	1.10	1.40	0.80	†
2....	1.60	2.40	3.60	4.90	2.10	1.30	1.30	.90	1.20	1.40	.80	†
3....	1.50	2.40	3.70	4.80	2.10	1.30	1.30	.90	1.20	1.30	.70	†
4....	1.50	2.40	3.70	4.80	2.20	1.30	1.30	.90	1.10	1.30	.70	†
5....	1.50	2.40	3.60	4.60	2.20	1.20	1.20	.90	1.10	1.20	.70	†
6....	1.50	2.60	2.70	3.60	2.20	1.20	1.20	.90	1.00	1.10	.80	†
7....	1.50	4.00	2.90	3.00	2.20	1.30	1.20	.80	1.00	1.10	.90	†
8....	1.50	4.00	2.90	2.50	2.10	1.40	1.20	.80	.90	1.10	1.00	†
9....	1.50	4.00	2.60	2.20	2.10	1.40	1.20	.80	.80	1.20	1.00	†
10....	1.50	4.00	2.60	2.10	2.20	1.40	1.10	.80	.60	1.20	1.00	†
11....	1.50	3.90	2.70	2.10	2.20	1.30	1.10	.80	.70	1.30	1.00	†
12....	1.50	3.70	2.60	2.10	2.30	1.30	1.10	.80	.70	1.20	1.00	†
13....	1.50	3.40	2.30	2.00	2.30	1.40	1.10	.80	.70	1.10	1.10	†
14....	1.50	3.20	2.25	2.00	2.20	1.40	1.10	.90	.80	1.00	1.10	†
15....	1.50	3.20	2.30	2.00	2.20	1.40	1.10	.90	.90	1.00	1.10	†
16....	1.50	3.10	2.40	2.00	2.20	1.40	1.10	.90	1.00	1.00	1.00	†
17....	1.60	3.00	2.50	2.10	2.10	1.40	1.05	.90	1.00	1.00	1.00	†
18....	1.70	2.90	2.60	2.10	2.10	1.40	1.05	.90	1.00	1.10	1.10	†
19....	1.90	2.90	2.70	2.00	2.10	1.40	1.05	.90	1.10	1.10	1.00	†
20....	2.50	2.90	2.80	2.00	2.00	1.50	1.10	1.00	1.10	1.10	1.00	†
21....	2.70	2.90	2.90	2.00	2.00	1.50	1.00	1.00	1.20	1.10	1.00	†
22....	4.10	2.90	3.00	2.00	2.00	1.50	1.00	1.00	1.10	1.00	1.00	0.50
23....	4.10	3.00	3.40	2.00	2.00	1.50	1.00	1.00	1.00	1.00	1.00	.80
24....	4.00	3.00	3.50	2.20	2.00	1.50	1.00	1.10	1.00	1.00	1.00	1.30
25....	3.90	3.00	4.70	2.20	1.80	1.60	1.00	1.20	1.20	1.10	1.00	1.40
26....	3.60	3.00	6.60	2.10	1.80	1.60	.90	1.20	1.40	1.00	1.00	1.70
27....	3.40	3.00	6.60	2.10	1.70	1.50	.90	1.20	1.45	1.00	.80	2.00
28....	3.00	3.20	6.30	2.10	1.60	1.50	.90	1.10	1.55	1.00	.70	2.30
29....	2.70	3.40	5.20	2.10	1.50	1.40	.90	1.10	1.50	.90	.50	2.70
30....	2.60		4.00	2.00	1.50	1.40	.90	1.10	1.40	.90	.40	3.00
31....	2.40		3.90		1.40		.90	1.00		.90		3.30

*Ice condition January and February. †Below gage.

NOTE.—The zero of the gage is 0.96 feet below the crest of the dam; therefore when the gage is below 0.96 all the water flows through a small flume.

DAILY GAGE HEIGHT, IN FEET, OF LOWER EEL RIVER AT CATARACT, IND., FOR 1905.[16]

DAY.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1....	3.3	2.1	3.3	2.4	3.9	2.0	2.0	1.1	1.6	1.6	1.8	2.4
2....	3.2	2.1	3.4	2.3	3.8	2.0	1.9	1.1	1.5	1.4	1.8	2.5
3....	3.1	2.1	3.5	2.2	3.8	2.0	1.8	1.0	1.6	1.3	1.9	2.4
4....	3.0	2.0	3.6	2.1	3.7	2.0	1.7	1.0	1.8	1.2	1.9	2.3
5....	2.9	2.0	3.6	2.1	3.5	2.1	1.6	1.0	1.9	1.2	2.0	2.2
6....	2.8	1.6	3.5	2.0	3.4	2.1	1.7	1.0	1.9	1.1	2.0	2.2
7....	2.7	1.6	3.4	2.0	3.3	2.0	1.8	1.1	1.8	1.1	2.1	2.3
8....	2.8	1.6	3.2	2.0	3.2	2.0	2.0	1.1	1.8	1.2	2.0	2.3
9....	2.8	1.6	3.0	1.9	3.5	2.1	2.0	1.2	1.8	1.2	2.0	2.4
10....	2.9	1.6	2.9	1.8	3.6	2.0	2.0	1.2	1.7	1.3	1.9	2.4
11....	2.9	1.6	2.8	1.8	3.6	2.1	1.9	1.3	1.7	1.3	1.9	2.4
12....	3.0	1.6	2.8	1.7	3.5	2.1	1.9	1.2	1.6	1.4	2.0	2.3
13....	3.0	1.6	2.7	1.6	3.5	2.0	1.8	1.3	1.5	1.5	2.0	2.3
14....	3.0	1.6	2.7	1.6	3.4	2.1	1.9	1.4	1.4	1.6	2.1	2.2
15....	2.9	1.7	2.7	1.6	3.2	2.2	2.0	1.6	1.3	1.6	2.1	2.1
16....	2.9	1.8	2.6	1.6	3.1	2.3	2.0	1.7	1.2	1.7	2.0	2.0
17....	2.8	1.8	2.5	1.6	3.0	2.4	1.9	1.9	1.2	1.8	1.9	2.0
18....	2.8	1.8	2.5	1.7	2.9	2.5	1.8	2.0	1.1	1.9	1.9	2.1
19....	2.7	2.0	2.4	1.7	2.8	2.6	1.7	2.5	1.1	2.0	1.8	2.2
20....	2.6	2.2	2.4	1.9	2.7	2.7	1.6	2.4	1.0	2.1	1.7	2.3
21....	2.6	2.3	2.3	1.9	2.6	2.8	1.5	2.4	1.0	2.3	1.6	2.4
22....	2.6	2.5	2.2	2.0	2.6	2.9	1.4	2.3	1.0	2.3	1.5	2.4
23....	2.6	2.8	2.2	2.0	2.5	2.8	1.3	2.2	1.0	2.3	1.5	2.3
24....	2.6	3.0	2.1	2.0	2.4	2.7	1.2	2.1	1.1	2.2	1.4	2.4
25....	2.6	3.0	2.0	2.2	2.3	2.6	1.2	2.0	1.2	2.1	1.5	2.5
26....	2.6	3.0	2.0	2.3	2.3	2.5	1.3	2.0	1.4	2.1	1.6	2.6
27....	2.6	3.1	2.0	2.5	2.2	2.4	1.3	2.0	1.5	2.0	1.7	2.6
28....	2.6	3.2	2.1	2.7	2.2	2.3	1.4	1.9	1.6	2.0	1.9	2.7
29....	2.5		2.2	4.0	2.1	2.2	1.4	1.9	1.6	2.0	2.0	2.8
30....	2.4		2.3	4.0	2.1	2.1	1.3	1.8	1.7	1.9	2.0	2.8
31....	2.3		2.3		2.1		1.2	1.7		1.8		2.7

NOTE.—Ice condition unknown.

[16] Water Supply and Irrigation Paper, No. 169, p. 86.

DAILY GAGE HEIGHT, IN FEET, OF EEL RIVER AT CATARACT, IND., FOR 1906.[17]

DAY.	Jan.	Feb.	Mar.	DAY.	Jan.	Feb.	Mar.
1	2.8	2.9	3.2	17	4.0	2.9	2.8
2	3.0	2.7	3.0	18	4.1	2.8	2.7
3	3.2	2.6	3.4	19	4.2	2.7	2.7
4	3.4	.....	3.3	20	4.2	2.7	2.6
5	3.6	.....	3.3	21	4.1	2.6	2.6
6	3.7	.....	3.2	22	4.0	2.8	2.5
7	3.7	.....	3.2	23	4.0	2.9	2.5
8	3.7	.....	3.1	24	3.9	3.0	2.6
9	3.6	.....	3.0	25	3.9	2.9	2.7
10	3.6	2.7	3.0	26	3.8	2.9	3.3
11	3.6	2.7	3.1	27	3.7	2.9	4.1
12	3.6	2.7	3.1	28	3.6	3.0	4.4
13	3.6	2.6	3.0	29	3.4		4.4
14	3.7	2.6	3.0	30	3.2		4.6
15	3.8	2.8	2.9	31	3.0		4.9
16	3.9	2.9	2.9				

NOTE.—River frozen February 4th to 9th.

DAILY GAGE HEIGHT, IN FEET, OF LOWER EEL RIVER AT CATARACT, IND., FROM JUNE 18, 1909, TO JUNE 18, 1910.

DAY.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	.....	1.4	1.7	1.1	1.1	1.2	1.3	1.2	1.3	3.7	1.2	1.3	1 2
2	.....	1.3	1.5	1.1	1.1	1.3	1.4	1.8	1.2	3.0	1.2	1.3	1 2
3	.....	1.3	1.2	1.1	1.1	1.3	1.4	2.0	1.7	2.5	1.2	1.8	1.2
4	.....	1.3	1.2	1.1	1.1	1.2	1.3	2.3	1.5	2.2	1.1	2.0	1.2
5	.....	1.2	1.2	1.1	1.1	1.2	1.3	2.5	1.5	2.0	1.2	1.5	1.2
6	.....	2.1	1.1	1.1	1.1	1.2	1.3	2.5	1.4	2.0	1.2	1.5	1.2
7	.....	2.8	1.1	1.1	1.1	1.2	1.4	2.3	1.3	1.7	1.3	1.5	1.1
8	.....	2.3	1.1	1.1	1.1	1.4	1.3	2.0	1.3	1.6	1.3	1.5	1.1
9	.....	1.6	1.1	1.1	1.1	1.3	1.3	2.0	1.2	1.5	1.3	1.6	1.1
10	.....	1.4	1.1	1.6	1 1	1.3	1.4	1.7	1.2	1.5	1.2	1.3	1.1
11	.....	1.5	1.1	1.7	1.1	1.3	1.4	1.3	1.2	1.4	1.2	1.3	1.1
12	.....	2.3	1.1	1.3	1.1	1.3	2.0	1.2	1.2	1.4	1.2	1.8	1.1
13	.....	3.7	1.1	1.1	1.2	1.3	3.4	2.8	1.2	1.3	1.2	1.6	1.1
14	.....	3.8	1.1	1.1	1.2	1.3	3.4	3.1	1.2	1.2	1.2	1.4	1.1
15	.....	1.9	1.1	1.1	1.2	1.2	2.5	2.8	1.4	1.2	1.2	1.3	1.1
16	.....	1.6	1.1	1.1	1.2	1.3	1.9	2.4	2.6	1.3	1.0	1.3	1.1
17	.....	1.5	1.1	1.1	1.2	1.4	1.6	2.0	1.5	1.3	1.2	1.3	1.1
18	2.1	1.3	1.1	1.1	1.2	1.4	1.4	3.6	1.4	1.2	1.2	1.3	.....
19	1.1	1.2	1.1	1.1	1.3	1.3	1.3	4.1	1.5	1.3	1.3	1.3	.....
20	1.6	1.9	1.1	1.2	1.3	1.3	1.3	3.9	1.5	1.2	1.3	1.3	.....
21	1.3	1.0	1.1	1.2	1.4	1.3	1.2	2.9	2.2	1.3	1.3	1.3	.....
22	1.5	1.3	1.1	1.2	1.4	1.3	1.2	2.3	2.5	1.2	1.3	1.3	.....
23	1.4	1.4	1.1	1.3	2.7	2.9	1.2	2.0	2.5	1.2	1.3	1.3	.....
24	2.3	1.3	1.1	1.2	1.8	2.7	1.2	1.3	2.0	1.2	1.2	1.2	.....
25	2.7	1.2	1.1	1.2	1.4	2.6	1.2	1.3	1.4	1.2	1.2	1.2	.....
26	3.4	1.3	1.3	1.1	1.3	2.6	1.2	1.2	1.6	1.2	1.2	1.2	.....
27	3.6	1.1	1.2	1.1	1.2	2.3	1.2	1.3	4.1	1.2	1.2	1.2	.....
28	2.9	1.1	1.3	1.1	1.2	2.3	1.2	1.4	5.6	1.2	1.4	1.2	.....
29	2.2	1.1	1.1	1.1	1.2	2.4	1.2	1.4		1.2	1.3	1.2	.....
30	1.6	1.9	1.1	1.1	1.2	2.1	1.2	1.3		1.2	1.3	1.2	.....
31	.....	1.7	1.1		1.2		1.2	1.2		1.2		1.2	

[17] Water Supply and Irrigation Paper, No. 205, p. 68.

RATING TABLE FOR LOWER EEL RIVER AT CATARACT, IND., FOR 1903 TO 1910.

Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.	Gage Height, Feet.	Discharge, Sec.-Ft.
1.0	10	1.8	638	2.6	1,479	3.3	2,205
1.1	21	1.9	742	2.7	1,585	3.4	2,311
1.2	50	2.0	845	2.8	1,688	3.5	2,418
1.3	127	2.1	948	2.9	1,790	3.6	2,527
1.4	212	2.2	1,050	3.0	1,893	3.7	2,633
1.5	320	2.3	1,157	3.1	1,996	3.8	2,753
1.6	428	2.4	1,263	3.2	2,098	3.9	2,873
1.7	532	2.5	1,370				

NOTE.—This table is based upon five discharge measurements made during 1903, 1904 and 1910. It is fairly well defined between 1.0 foot and 2.6 feet. It has been extended beyond this limit. Beyond 3.9 feet the curve is considered a tangent with a difference of 120 per tenth.

During the time the records have been kept in this station, there have been periods when there was practically no discharge. These periods occurred when the gage registered less than 1.0 feet. Four such periods occurred in 1904, from July 26 to August 20; Sept. 8 to 16; Oct. 29 to Nov. 8; and Nov. 27 to Dec. 24. During 1905 and 1906 no such periods occurred. During the year June 18, 1909, to June 18, 1910, the gauge never registered less than one foot.

WEST FORK OF WHITE RIVER AT MAYSVILLE, INDIANA.

This station was established by W. M. Tucker, July 31st, 1909, at the Washington Waterworks plant at Maysville, Indiana. It was a chain gage and was attached to a cedar pole firmly braced and anchored on the east bank of the river near the waterworks engine room. The datum of this gage was 27.89 feet below the sill of the second door from the southwest corner along the west side of the Washington Waterworks plant. The river at this point has a straight channel for a half mile above and below the gage. The river bed is composed of sand and clay. The gage was read daily by Gus Gutch, chief engineer of the Washington Waterworks Company, from August 1st, 1909, until December 18th, 1909, when the gage was damaged by ice. The gage has not been re-established. The single current reading was taken from a boat and cable, directly across the river from the gage.

DISCHARGE MEASUREMENT ON WEST BRANCH OF WHITE RIVER AT MAYSVILLE, IND.

DATE.	Hydrographer.	Width of River, Feet.	Gage Height, Feet.	Discharge, Sec.-Ft.
August 1, 1909	W. M. Tucker	230	10.0	1,636

DAILY GAGE HEIGHT, IN FEET, OF THE WEST FORK OF WHITE RIVER, AT MAYSVILLE, IND., FROM AUGUST 1 TO DECEMBER 18, 1909.

DAY.	Aug.	Sept.	Oct.	Nov.	Dec.	DAY.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10.5	8.4	7.5	9.2	12.3	17	8.7	7.5	7.0	8.5	18.8
2	12.0	8.4	7.3	9.0	11.9	18	8.6	7.4	7.2	8.9	19.3
3	11.5	8.5	7.3	9.1	11.2	19	8.7	7.4	7.3	9.2	.....
4	10.8	8.3	7.2	8.8	11.0	20	8.5	7.3	7.3	9.9	.....
5	10.3	8.1	7.2	8.8	11.0	21	8.6	7.1	7.8	9.9	.....
6	10.2	8.8	7.2	8.6	10.8	22	8.6	6.9	8.1	9.8	.....
7	9.8	8.0	7.0	8.9	10.8	23	8.4	7.3	8.4	9.9	.....
8	9.5	7.7	7.0	8.3	11.6	24	8.2	7.3	8.6	1.09	.....
9	9.2	7.7	7.0	8.3	11.5	25	8.1	7.3	10.0	13.3	.....
10	9.0	7.7	6.8	8.2	11.0	26	8.0	7.4	11.1	15.0	.....
11	8.8	7.8	6.6	8.2	*	27	8.0	7.5	11.2	15.7	.....
12	8.7	7.1	6.6	8.4	12.4	28	8.0	7.7	11.1	16.2	.....
13	8.6	8.2	6.8	8.4	15.0	29	8.5	7.7	10.6	15.0	.....
14	8.5	8.1	6.9	8.3	17.3	30	8.4	7.6	10.1	13.6	.....
15	8.4	7.9	6.8	8.2	18.6	31	8.3		9.6		.....
16	8.6	7.7	6.9	8.1	18.7						

*No record.

The lowest discharge occurred at this station from October 10 to 16, but since an insufficient number of current readings were taken to determine a rating table, the discharge at this time cannot be determined. This data will be of interest if this gage is re-established and a rating table determined.

PROFILE OF WEST BRANCH OF WHITE RIVER.

STATION.	Distance Apart, Miles.	Distance from Noblesville, Miles.	Elevation, Feet.
Noblesville	0	0	741
Indianapolis	34	34	675
Martinsville	43	77	600
Spencer	38	115	540
Worthington	32	147	506
Newberry	38	185	476
Edwardsport	29	214	445
Washington (B. & O. bridge)	25	239	419
Junction (E. Fork)	17	256	400
Mouth (White River)	50	306	376

Power Sites on the West Fork of White River.

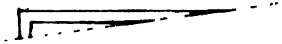
The writer traversed the West Fork of White River from Noblesville to its junction with the East Fork. The fall in this part of the river is very uniform. The profile of the river shows the fall to average about two feet per mile near Noblesville, and about one foot per mile near the junction with the East Fork. There are no abrupt falls such as found at Tannehill Bridge and Shoals on the East Fork. The greatest abrupt fall is at Spencer, where there is 2.25 feet on one ripple. Eel River, which enters the main branch of the West Fork at Worthington, has an excellent power site at Cataract. No other power site occurs on this tributary

Fig. 5. Upper Fall on Eel River.

except near its mouth, where a small amount of power could be procured.

CATARACT.

One-half mile north of Cataract, in Owen County, is the site of an old power mill. The old mill stands on the west bank of Eel River at the crest of an abrupt fall twenty feet high, figure 5. Above the fall is a rapid which adds ten feet to the abrupt fall. At the head of the rapid, which is about fifty yards in length, is a concrete dam which adds four feet more to the fall. A concrete race leads the water from the pond above the dam to the mill, where a fall of thirty-four feet occurs. This is a splendid site for a power plant, but it is not employed at the present time, and the mill is rapidly decaying.



Another fall occurs one-half mile down stream, figure 6. This fall has approximately the same fall as the former. The entire fall from the crest of the dam above the upper fall to the pond below the lower fall is eighty feet. Between the falls the valley is broad and is extended by a tributary from the northeast. Both the falls occur in Mitchell limestone, which is well exposed at the falls and in the bluffs. The amount of water available at this point is too small to depend upon for continual power. However, the facilities for storage are good. A dam 45 feet high located above the lower fall, as indicated in the topographic map, figure 7, would pond the water to the crest of the present dam above

Fig. 6. Lower Fall on Eel River.

the upper fall. The edge of the pond would follow the eighty foot contour. It would cover .31 of a square mile, or 198.4 acres. The capacity of this pond would be 222,606,635 cu. ft.

Along the crest of the ridge south of the lower fall is a saddle which is so low that it would form a spillway if a pond were constructed as indicated above. The water would then escape through the valley which enters the main valley below the lower fall. This spillway could be dammed very easily. However, the storage basin could be enlarged by damming the tributary valley at the point indicated on the map. This dam would be 35 feet high. The pond formed by this dam would cover .131 of a square mile, or 83.84 acres. The capacity of this pond would be 54,560,455 cu. ft. The whole reservoir would cover .441 of a square mile. or

282.24 acres. The entire capacity of the reservoir would be 277,167,090 cu. ft.

From the gauge reading and rating table it is calculated that the entire runoff for the year 1904 was 22,351,690,000 cu. ft., or enough to fill the reservoir over eighty times. If this runoff could have been controlled and used regularly it would have produced over 5,000 horse power continually on eighty feet fall. However, it is evident from the gauge readings that the monthly discharge is very irregular. The following table shows the monthly discharge:

January	2,863,555,200 cu. ft.
February	5,053,708,800 cu. ft.
March	6,497,020,800 cu. ft.
April	3,936,988,800 cu. ft.
May	2,285,798,400 cu. ft.
June	580,089,600 cu. ft.
July	94,262,400 cu. ft.
August	24,537,600 cu. ft.
September	144,460,800 cu. ft.
October	111,801,600 cu. ft.
November	20,227,600 cu. ft.
December	739,238,400 cu. ft.
Total	22,351,690,000 cu. ft.

These figures show that no monthly discharge between June and December was sufficient to fill the reservoir. If this water be retained in the reservoir a reduction must be made for evaporation. In this latitude the evaporation from water surfaces is about forty inches per year. During the dry summer months the evaporation would be heavier than during the winter months. The evaporation during these months is about four and one-half inches per month. This depth over the surface of the reservoir (.441 sq. mi.) amounts to 4,610,390 cu. ft. Thus, this amount must be deducted from each month's discharge. The following table shows the reduced amounts from June to November, inclusive:

June	575,479,210 cu. ft.
July	89,652,010 cu. ft.
August	19,927,210 cu. ft.
September	139,850,410 cu. ft.
October	107,191,210 cu. ft.
November	15,617,210 cu. ft.

Since the month of November had the minimum discharge, the amount of power, which could be produced continually during the month on the eighty feet fall, will be considered. To reduce

this discharge to a continual discharge per second during the month the total discharge is divided by 2,592,000, the number of seconds in a month of thirty days. Using this quotient in the formula $\frac{\text{discharge} \times \text{feet fall}}{11}$ = practical horse power, the power which could be produced is found to be 43.81 horse power.

In the above calculation the water stored in the reservoir is not considered to be used. The following calculation shows that almost 250 horse power could have been produced continually during the drouth of 1904. If the water from the reservoir be used the head will necessarily fall below eighty feet. Since considerably more than half the volume of the reservoir occurs within a depth of twenty feet from the surface, a head of sixty feet will give a conservative working basis. To produce 250 horse power on a sixty foot head, it is necessary to use 122,760,000 cu. ft. of water during a month of thirty-one days, and 118,800,000 cu. ft. during a month of thirty days. If the reservoir be full at the end of June and 250 horse power be produced regularly thereafter, the following reservoir conditions would exist:

	In Reservoir at Beginning of Month.		Runoff During Month.		Necessary to Produce 250 H. P. per Month.		In Reservoir at End of Month.
July	277,167,090	+	89,652,010	—	122,760,000	=	244,059,100
August	244,059,100	+	19,972,210	—	122,760,000	=	141,226,310
September	141,226,310	+	139,850,410	—	118,800,000	=	163,276,720
October	163,276,720	+	107,191,210	—	122,760,000	=	147,707,930
November	147,707,930	+	15,617,210	—	118,800,000	=	44,525,140
Dec. 1–24	44,525,140	+	0	—	91,080,000	=	—46,554,860

This calculation shows that there would have lacked 46,554,860 cu. ft. to have produced the 250 horse power. However, in calculating the monthly discharges, all discharge was neglected when the gage registered less than one foot. This occurred on seventy days during the drouth. During this time there was a small discharge. Since the evaporation correction was considered high, head of water low, and no discharge for the seventy days, it is probable that the 250 horse power could have been continually produced.

During the year 1905 no drouth occurred. The gage readings show the smallest monthly discharge to have been in September. The discharge during that month was 823,910,400 cu. ft., which would produce 2,311 horse power for one month. The gage readings for the year do not seem to be accurate, however, for the total discharge for the year is entirely too high.

The gage records for 1909-1910 are accurate. The lowest discharge occurred in August and September, 1909. During these months 500 horse power could have been produced continually.

The general conclusion concerning this site is that from 1,000 to 2,000 horse power could be produced during eight months of ordinary years and 500 to 1,000 horse power during the remaining four months. During exceptionally dry years the minimum would be about 250 horse power. The reservoir is too small to control the discharge.

MOUTH OF EEL RIVER AT WORTHINGTON, INDIANA.

On Eel River, 250 yards above the highway bridge at Worthington occurs an old dam site. The bank on the east side of the river is of Mansfield sandstone eighteen feet high above low water. This sandstone cliff forms an excellent abutment for a dam. The opposite bank is of river deposit, sand and loam, about fourteen feet high. Remains of the former dam make the river narrow and shallow at this point. The bed of the river is solid Mansfield sandstone. A ten foot dam at this point would not flood the low land above in ordinary stages of water. Such a dam would back the water about three miles in the channel, but would form practically no storage. The sandstone ledge on the east would form an excellent foundation for a power house, and a short race could also be cut into it.

The drainage basin of Eel River above this point is between five and six times as great as the drainage area above Cataract. If the discharge is correspondingly large, 1,000 horse power could be produced for eight months of the year with an average rainfall.

MAIN BRANCH OF WEST FORK.

NOBLESVILLE, IND.

During September, 1909, when this part of White River was investigated, The White River Light & Power Company of Noblesville was constructing a waterpower plant on White River two miles north of Noblesville, near the section line between sections 19 and 20, T. 19 N., R. 5 E. The river bed at this point is in glacial drift. The channel is 700 feet wide. The south bank is high and slopes gradually up to the south bluff. The north bank is about twenty feet high and slopes very gently upward up to the highway which parallels the river on the north. This highway is forty rods from the river at this point, and is about fifty feet above low water of the river.

The dam, when completed, is to be 594 feet in length and eighteen feet high. It is to be built entirely of concrete. The entire exposed works will be 692 feet, turbine house 96 feet, seven waste gates 112 feet, spillway 184 feet, distance in embankment 300 feet. The power house is on the north end of the dam. It will probably be necessary to construct a wing dam along the north bank. The backwater will reach five miles. All the land which will be injured has been purchased. Five pairs of horizontal, single discharge, twin turbines will be installed. Each will have a capacity of 330 horse power. The entire capacity will be 1,850 horse power.

The drainage area of the West Branch of White River above Noblesville is approximately 1,000 square miles. The average precipitation in this basin for the past ten years was about 39.5 inches per year. The run off in this state is about one-third of the total precipitation. Thus the runoff from this basin is approximately thirteen inches per year. This would give an average discharge of the river at Noblesville of 958 cu. ft. per second. If this could be controlled and used regularly it would produce continuously 1,567 horse power on eighteen feet fall. However, the storage facilities at Noblesville must necessarily be inadequate for storing the flood water, because the storage basin is all in the river channel. Thus during the flood seasons it will be possible to produce the 1,850 horse power, except when the river is so high that the head will be reduced by the overflow on the dam. During several months of the year, however, the power must be much less than the average 1,567 horse power. According to the data taken at Indianapolis during 1905, the discharge for the year represented a depth of 10.81 inches runoff from the drainage basin. The report of the United States Weather Bureau for the same year gives the precipitation as above the average. Hence the estimated depth of thirteen inches runoff is too high rather than too low. In the short discussion following the data taken at Indianapolis it is shown that there were several days in 1904 and again in 1905 when the discharge ran below 180 cu. ft. per second. The discharge at these times was smaller at Noblesville than at Indianapolis. However, if it be considered the same, the power at Noblesville during these periods would have been less than 294 horse power. The data from the Indianapolis station may not be entirely trustworthy, for reasons which will be given in a following paragraph. However, there can be no doubt that the power at Noblesville will run below

three hundred horse power for long periods during years of average rainfall.

There is no developed power on the West Branch of White River below Noblesville. The fall on the river between the L. E. & W. Railroad bridge at Noblesville and the West Washington Street bridge at Indianapolis is 66 feet. Two dams occur on this part of the river. The Broad Ripple dam at Broad Ripple turns the water from the river into the canal of the Indianapolis Waterworks Company. This canal conducts the water to the Waterworks plant in Indianapolis. The Riverside dam at Riverside Park ponds the water for boating purposes in the park. Each of these dams is about twelve feet high. The fall on and between these two dams occupies about half of the fall from Noblesville to Indianapolis. This leaves thirty-three feet fall between Noblesville and Broad Ripple which is not used. The natural environment for developing this power is as favorable as that at Noblesville, Broad Ripple or Riverside. Good rock exposures occur in the bed of the river near the head of the back water from Broad Ripple dam. The best site for a dam in this part of the river has not been determined. However, the convenient market for power in Indianapolis and vicinity, should make its development in this part of the river very profitable. The great objection to this power, as is true of all the water power of the state, is its extreme irregularity.

When the Broad Ripple dam was visited on September 12, 1909, no water was passing. All the water passed into the Waterworks canal. The river bed below the dam was dry except for an occasional small pond. There was no running water in this part of the river. The river at this point flows on a deep deposit of glacial gravel in which the underflow is great. Two miles below the dam a small stream was flowing in the river bed. This stream was furnished by the underflow. At Riverside dam the discharge at this time was probably forty or fifty cu. ft. per second. At the mouth of Fall Creek this discharge was probably doubled, but the river did not resume its regular flow until the last sewer in the southern part of the city had been passed. Because the water is taken from the river at Broad Ripple and discharged into the river again by the sewers, etc., of the city, the volume of water in the river, anywhere between Broad Ripple and the last sewer of the city, is not normal. This deficiency gradually decreases down stream from the Broad Ripple dam. The per cent. of deficiency is greatest during low stages of the river.

The gaging station which the United States Geological Survey maintained at Indianapolis during 1904 to 1906 was located within the limits of the deficient flow. It was located below the mouth of Fall Creek but above the large sewers of the city. While the data from the station, no doubt, is accurate for the point where the station was located, yet it is evident that it does not represent the normal discharge for the West Fork of White River in this part of its course. If the station had been located three miles further down stream it would probably have shown a considerably greater discharge during low stages of the river.

Three miles by river below the Union Station at Indianapolis, between the mouth of Pleasant Run and Big Eagle Creek, is a half mile of the river in which the fall is greater than is usual in this part of the stream, and the current is correspondingly swifter. This is due to the recent cutting off of a large oxbow bend in the river. A fall of about two and one-half feet occurs on this ripple. The fall is entirely in glacial gravel, and for this reason is very temporary. It will soon be distributed by an adjustment of the gravel bed.

WAVERLY, IND.

Throughout the rest of Marion County and Johnson County the river is very sluggish. No development of power seems feasible in this part of the stream. An abrupt fall of one foot occurs at Waverly, in Morgan County, over the remains of an old mill dam. A woolen mill formerly used the power from the river at this point. The old timber dam is now in decay. By the construction of a new dam, a head of fifteen feet could be procured here. This river is narrow and the banks are comparatively high.

Throughout Morgan County the river is flowing on the Knobstone formation. Exposures of rock in the bed of the stream are numerous in the eastern and central parts of the county. These exposures make good foundations for dams, but the rock is of no use in dam construction. It is comparatively soft sandstone and shale.

HIGHROCK.

Highrock is located three miles northwest of Martinsville. An abrupt bluff of Knobstone sandstone forms the west bank of the river here. A carding mill formerly used power from the river at this point, and the remains of the old dam still cause an abrupt fall of 1.52 feet. The dam is on a foundation of Knobstone. This

is an excellent location for a power site. At least fifteen feet head could be procured, and the bluff on the west makes an ideal location for a plant. The convenience of this site to Martinsville makes it an extremely desirable location. It is within three-fourths of a mile of the Martinsville Traction line.

SPENCER, INDIANA.

The West Fork of White River is very crooked and sluggish between Martinsville and Gosport. The development of any power in this part of the river does not seem feasible. After passing Gosport the river becomes swifter. An abrupt rocky ripple occurs one-fourth of a mile above the highway bridge at Spencer. This ripple is forty rods in length and in this distance has a fall of 2.25 feet. The entire bed of the stream is on Harrodsburg limestone, which also forms the south bank of the stream. The north bank is a deposit of alluvium. The river banks are high. Sixteen or seventeen feet head could be procured at this point. A dam of this height would injure but little land. The back water would extend about eleven miles. This is one of the best power sites on the West Fork of White River. Indianapolis is about fifty-five miles, Terre Haute about forty miles, and Brazil about thirty-five miles from this site. These are the most convenient markets for power.

This branch of the river is very sluggish and crooked after it leaves the Mitchell limestone, a short distance below Spencer. The banks are low and the valley wide. Few rock exposures occur and the conditions for water power development are very poor. The only point at which any development seems feasable is at Aprow.

APROW, INDIANA.

Aprow is the local name for a point on the West Fork of White River, four miles northeast of Wheatland, and four miles southeast of Bicknell. There is no town here, and the name will not appear on any map. At this point the river flows against the west bluff, and exposes shale and coal, which form the bed and west bank of the stream. On this exposure the fall is sharp and the stream rapid. The east bank is twelve feet high. A line of levels over the fall for half a mile showed 4.6 feet fall. The fall above and below this point is very slight, estimated at .66 foot per mile. The river valley is between a mile and a mile and a half wide on this part of the river. The land is very valuable farm land. Because of the low banks and the value of the land a head of ten feet is

all that can be procured at this point. The discharge at Aprow is about equal to that of Shoals, on the East Fork, or probably somewhat greater. From 400 to 1,000 horse power could be procured at this point, except in the lowest and highest stages of the river. The cost of developing this power would not be great. The river is about 300 feet wide, the banks are abrupt and the bed rocky. Washington and Vincennes are convenient markets for this power.

Below Aprow the river again becomes sluggish and no power could be profitably developed between Aprow and the junction with the East Fork.

MAIN BRANCH OF WHITE RIVER.

The fall on the Main Branch of White River from the junction of the two forks to its mouth at Mt. Carmel, Illinois, is but 24 feet. The distance is approximately fifty miles by the river. An exposure of rock occurs in the river bed three miles above the mouth. This place is known as Kelley's Ripple. The fall on this ripple within .25 mile is 1.4 feet. The banks here are fourteen feet high. During flood periods the river overflows both banks. Both banks are alluvium. The valley is very wide. This is the only point on the Main Branch of White River where a development of power is feasible. If a head of ten or twelve feet could be procured at this point, the volume of water, as calculated from the Shoals data, is sufficient to produce a minimum of about 500 horse power. For the most of the year 2,000 to 3,000 horse power could be procured. Evansville and Vincennes are convenient markets for this power.

WABASH RIVER SYSTEM.

No investigation was made of the Wabash River System except of two small power sites on Sugar Creek. Sugar Creek is a small stream which rises in Clinton and Boone counties, flows in a general southwesterly direction through Montgomery and Parke counties and empties into the Wabash River, four miles southeast of Newport. This stream drains an area of about 1,000 square miles. It is a very rapid stream and abundant power is available when there is sufficient water. No investigation of the discharge of this stream has been made, except one current reading, which was made September 27, 1909. This reading was taken at Shades of Death, five miles northwest of Waveland, Montgomery County. The stream was not at low water mark. Discharge measurements: September

27, 1909, Hydrographer, W. M. Tucker; width, 74 feet; area of cross section, 105.9 sq. ft.; discharge, 273.5 cu. ft.

The valley of Sugar Creek is narrow and little bottom land occurs. At Pleasant View, which is three miles below Shades of Death, the river is only 500 feet wide. The bed of the stream is in the Knobstone formation and the bluffs are capped by Harrodsburg limestone. A dam could be constructed 20 feet high at this point. This would pond the water past the Shades of Death and would produce an excellent boating pond for the hundreds of people who visit the Shades every summer. It is probable that the discharge at Pleasant View seldom falls below 100 cu. ft. per second. This discharge on 20 feet fall would produce 182 horse power. The cost of developing this power would be small. The power could be used on the pleasure grounds at Shades of Death, and the convenience and amusement furnished thereby would greatly increase the number of visitors at this already popular pleasure resort.

The other site visited on this stream is the Narrows, on the farm of John Lusk, Sec. 26, T. 17 N, R. 7 W. A flour mill was formerly operated on this site. The river banks at this point are of solid Mansfield sandstone, twenty-five feet high. They are abrupt and but eighty feet apart. From the top of the banks the slopes rise abruptly to a height of 150 feet. This is an ideal site for a dam. A concrete dam properly constructed between the sandstone cliffs would be almost as solid as the cliffs themselves. The conditions for locating a power house are also ideal. It is probable that a minimum of 250 horse power could be produced at this point. The up-stream conditions are not known.

GAGES FROM WHICH NO DATA HAS BEEN RECEIVED.

During the summer of 1910, gages, of which the descriptions and locations follow, were established.

On July 6, 7 and 8 a direct reading gage was established on the Mississinnewa River at Peoria, five miles southeast of Peru, Indiana. This gage is made of heavy white oak bridge planks. It s securely spiked to the root of a small tree and to two white oak posts. The gage is placed with the slant of the river bank, which is about thirty degrees. The scale is made of brass headed tacks on the up-stream side of the gage. This gage is located two hundred yards down stream from the mill of H. F. Whisler. The gage is read each day by Mr. H. F. Whisler, Peru, Ind., R. F. D. No. 11.

On July 11 and 12 a chain gage was established on the St. Joseph River at South Bend, Ind. This gage is located on the up-stream handrail of the south span of the Leaper bridge which crosses the St. Joseph River on North Michigan Street. This gage was read daily by J. W. Fisher, 601 N. Cushing St., South Bend, Indiana. The chain of this gage was stolen late in October and has not been replaced.

On July 14 and 15 a chain gage was established on Eel River at Logansport, Indiana. The gage is located on the down-stream handrail of the south span of the Third Street bridge, which crosses Eel River on Third Street. This gage is read daily by Henry J. Kruck, Logansport, Indiana.

On July 16 and 18, a chain gage was established on the Wabash River at Logansport, Indiana. This gage is located on the down-stream handrail of the south span of the Cicott Street bridge, which crosses the Wabash River on Cicott Street. This gage is read daily by William Sehrt, Logansport, Indiana, R. F. D. No. 6.

On July 19, the Imler Bridge, which crosses the Tippecanoe River five miles west of Delphi, Indiana, was visited with the view of establishing a gage thereon. A gage which belongs to the United States Geological Survey was already located on this bridge. It is not now in use. If the work on water power is continued in Indiana arrangements can be made to continue this station by corresponding with District Engineer A. H. Horton, Federal Building, Newport, Kentucky.

On July 21 and 22, the Wabash River at Terre Haute was investigated with the view of establishing a gage at that point. It was found, however, that the Terre Haute Waterworks Company had maintained a gage on the river at this point since June 1, 1901. In case the work on waterpower were continued in the State the data would be of value. Mr. Taylor, Chief Engineer of the Terre Haute Waterworks Company, has kindly offered this data for the use of the State.

A current reading was taken at each of the above stations. The results of these readings are of no value in this report, because no gage readings have been received or rating tables made for these stations, but they will be of value if the problem is continued. The data can be found in the writer's field book in the office of the State Geologist, at Indianapolis.

THE OAKLAND CITY, INDIANA OIL FIELD IN 1910.

BY RALPH F. BLATCHLEY.

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Upon the opening of any new oil field, it seems desirable that a geologic and economic study be made of the area—such as means will allow—in order to be of benefit both from an educational point of view to the commonwealth and as a source of some help to the oil trade. The primary object of this brief report is to show the stratigraphic relations of the field; preserve in printed form the number of records available from the Oakland City oil field, and to present the economic features peculiar to this territory. The saving of records is especially important in view of the fact that much future work with oil areas will be based upon stratigraphic and structural studies of them. It so often occurs in successful oil fields that, once the producing sand is located, wells are put down with such rapidity that records are carelessly kept and are practically lost for future use. We wish to urge that all records be kept, as well as conditions will allow, and be sent to the Survey.

No attempt has been made in this report to show the local structural features of the sand in this field, because the Indiana Survey has not the means or time at present to run levels to all the wells, making therefrom a structural diagram indicating the presence and possible extension of anticlines, terraces and domes, suggestive of the accumulation of oil and gas. Water conditions of the oil horizon generally accompany a structural report and greatly assist in the study. It is unfortunate that such could not be made at this time. Some structural conditions are pointed out later, but they were taken from the Ditney Folio of the U. S. Geological Survey.

The method of study involved in this report, aside from the field work of gathering records and data for the accompanying map, was to take representative records of the Oakland City field and make a stratigraphic study of them in comparison with records of the Illinois fields. It was essential to do this, inasmuch as the several oil areas lay within the so-called Eastern Interior Coal Basin, and the formation from all areas were comparable. The

depths to the various horizons were variable, but they were due to the position of the wells upon the flanks of the basin.

Acknowledgments. In the preparation of this report the writer had the valuable assistance of Raymond S. Blatchley, in charge of the oil studies of the Illinois State Geological Survey, for the geological interpretations and the stratigraphic comparisons. The remainder of the report would not have been possible except for the aid of the various operators in the field, who furnished well records and other information. To Messrs. W. H. Heydrick of Princeton; Frank Woodard and W. W. Fleming of the Ohio Oil Company; H. W. Vedder, G. H. Shoup, Walter Cox, W. E. Hancock, B. C. Chappel, V. S. Welch and the Murphy Oil Co., of Oakland City; John Miller of Vincennes, W. J. Rodgers of Evansville, and others, the writer expresses his appreciation and thanks.

Location of the Field. What is known to oil men as the Oakland City Oil Field is located about three and a half miles east of Oakland City, in the civil townships Monroe and Patoka of Pike County. Although the field is in Pike County and Oakland City is in Gibson County, the field is known as the "Oakland City Field" because all the oil men make their headquarters in that city, and all of the supply houses are there located.

The whole producing field is located in congressional township 2 S., Range 8 W. No production has been found outside of the district thus defined. Drilling has been done to the south, northwest and north of this territory, but with no production. Within the above mentioned area there had been drilled, up to December 1, 1910, 201 producing wells, 18 gas wells and 32 dry holes. On the above date there were 13 drilling wells within these limits. The pool as it now stands is approximately four miles long and two miles wide in its widest place.

Drainage and Elevations. The drainage of the field finds its way to the Patoka River, which flows in a westerly direction a mile to to the north of the field. The streams through the territory (Township 2 S., Range 8 W.) are the South Fork or the South Patoka, Barren Creek and Hat Creek. The first of these, a fair sized stream, is sluggish, and in rainy seasons overflows and covers its broad bottoms.

The topography of most of the area is very rolling, consisting of rugged uplands with the broad bottoms along the South Fork. The only permanent Government bench-mark in the field is at the center of section 26, Monroe Township, and shows an elevation of 458 feet above sea level. The Ditney Folio of the U. S. Geological

Survey gives a range of surface contour levels of 400 to 500 feet for the area.

Chas. W. Shannon, in the 1909 report of this Department, says of the soils and crops of this area: "Corn grows fairly well but gives a low yield. Small fields of wheat are grown in the upper parts. Hay makes a rank growth, but is sometimes rather coarse. The soils along the entire (Patoka) system have been largely leached of their natural plant foods, and such cultivation as will restore organic matter to the soil will be of benefit."

Transportation. The only railroad crossing the field is the Southern or L. E. & St. L. Railway. However, the Evansville and Indianapolis Railway runs through Oakland City, and the field is therefore easy of access from all directions.

The roads in this section are almost all unimproved, road material being scarce. They are, for the most part, dirt roads, and during wet weather become very badly cut up by the extensive hauling to and from the field. However, there are several very good rock roads kept up by the county.

Early History of the Field. The history of the Oakland City field dates back probably ten years, when a company of Oakland City business men looking for gas put down a bore north of Oakland City in Gibson County, on what was then the Alcorn farm, now owned by Mr. Chas. Feltner of Oakland City. This bore was drilled to a depth of from 1,050 to 1,100 feet. It is said that the same salt sands and limestone formations were passed through as are found in the present field.

The next operations in this territory were those of Messrs. Lobby and Davis of Winslow. Their first attempt to get oil was on the F. F. Wood farm in the northwest quarter of the northwest quarter of section 18 (2 S., 7 W.), Patoka Township. Here a good showing of oil was found, but the depth at which it was located is not known. Farmers are said to have baled out the oil and hauled it off in barrels. The well was never pumped. Later this well was drilled deeper with the hopes of getting enough production to warrant pumping. It was, however, drilled into salt water and abandoned. The above mentioned parties then moved to their second location on the E. Freshour farm, southeast quarter of the southwest quarter of section 7, near the town of Arthur. This test was never drilled deep enough to get results, owing to legal difficulties, and the bore was abandoned. These wells are known as the Pioneer wells, and had a great bearing on the location of the Oakland City pool.

Another unsuccessful attempt was made to get oil about two miles north of Winslow, which resulted in a dry hole at from 1,200 to 1,300 feet.

In 1907 Mr. W. H. Heydrick of the Michael Murphy Oil Company came to Oakland City and looked over the territory. After having studied the Robinson field, he had the theory that, as this field had reached its southern limits and the anticline had run out, the oil of the Illinois basin had drifted farther east for its level. He therefore set about to choose a place to wildcat. Being influenced by the Pioneer well, and believing that coal outcroppings denote more or less the presence of an anticline, he chose the location of the Oakland City pool. He then set about leasing an extensive territory.

On July 26, 1907, the Michael Murphy Co. began operations on the C. D. Houchens farm, in the southwest quarter of the northwest quarter of section 15, Patoka Township. A few days later the Southern Oil Company started a well near the Arthur wells, on the T. W. Wood farm, northwest quarter of the northwest quarter of section 18, Patoka Township. This was drilled into the sand before the Murphy well. The producing sand was reached at 1,165 feet, and a fair showing of oil was obtained. This well was shot and for a short time pumped 15 barrels per day. Later it was shut down because the amount of oil produced had dwindled until there was not enough to warrant tank building. Recently, however, the well has been cleaned out and put to pumping.

The Murphy bore, on the C. D. Houchens farm, turned out a dry hole with a very small showing of oil at 1,162 feet, the drill going to 1,444 feet. A careful record of the strata passed through was kept, and can be found under the heading Section 15, Patoka Township.

Benedum and Trees, operators, then drilled a dry hole on the George Skinner farm, southwest quarter of the northwest quarter of Section 18, Patoka Township. This location was just south across the line from the Southern Oil Company's well on the T. H. Wood farm.

Early in 1908 the Michael Murphy Company started operations on the M. Burnett lease, southwest quarter of the northeast quarter of Section 26, Monroe Township, and on April 28, 1908, they drilled in the first gas well in the Oakland City field. A fairly complete record was kept of this well and will be found under Section 26 in the Detailed Study of Logs.

In August, 1908, Murphy & Company moved to the J. Yager farm, northeast quarter of the southwest quarter of Section 26, Monroe Township, and a quarter of a mile south and a little west of the Burnett well, drilling in the first producing well in the field. This well flowed natural, i. e., without being shot, 30 barrels a day for a considerable time. The usual excitement following a strike in a new territory ensued. Leases were taken in all directions, large bonuses being paid for those in the immediate vicinity. The excitement became greater when W. J. Rodgers & Co. drilled in the second producing well in the field on the M. Skinner lease, southwest quarter of the northwest quarter of Section 24, Monroe Township (2 S., 8 W.), about one and one-half miles northeast of the Yager well. This well started with 30 barrels daily production.

Promiscuous wildcatting started in all directions, resulting for the most part in dry holes. Gibson & Cox started a wildcat on the Joel Skinner farm, northeast quarter of the northeast quarter of Section 3, Monroe Township (3 S., 8 W.), and about a mile and a quarter south and a half mile west of the Yager No. 1 well. This was the farthest south attempt and resulted in a dry hole. Several other dry holes were drilled, and then Gibson & Cox drilled in the third producing well on the Amelia Skinner lease. Drilling then centered around these three producers and gradually the operators felt their way till they have reached all but the northern limits of the pool. In a general way the field may be said to have begun in the southern end and gradually moved north.

GENERAL GEOLOGY OF THE AREA RELATING TO OCCURRENCE OF OIL AND GAS.

All oil men who are in close touch with field operations are familiar with the various formations, such as sandstone, shale, limestone, coal and red rock, comprising combinations of rocks that underlie most of Illinois, the western portion of Indiana and a small part of western Kentucky, or what is known as the "Eastern Interior Coal Basin." The rocks are all sedimentary and are, for the most part, of considerable regularity in distribution or areal extent and sequence. The study of these relations is known as stratigraphy. By means of graphic comparisons, the formations in one locality can be correlated with those of another, and thus the operator is enabled to know approximately the geological horizons in which he is working. All the oil areas of Illinois, and of

Princeton and Oakland City, Indiana, lie within this Eastern Interior Coal Basin. The general formations of each field are comparable throughout the basin and vary only in position, depending on whether the field lies along the flanks or in the central part of the basin. The stratigraphic column is much longer, of course, in the central portions of the basin than it is toward its outer edges, as in the Lawrence and Martin County fields of Illinois when compared to the Sparta and Bond County fields of Illinois and the Princeton and Oakland City fields of Indiana.

THE EASTERN INTERIOR COAL BASIN.

The Eastern Interior Coal Basin is estimated by Ashley* to have an area of 35,000 square miles in Illinois, 6,500 square miles in Indiana and 4,500 square miles in Kentucky, making a total for the entire field of 46,000 square miles. The basin dips very evenly to the center from its western, northern and eastern sides, and very rapidly from its southern rim, the deepest part of the basin lying in the vicinity of Wayne, Hamilton, Edwards and White counties of Illinois.

The only notable structure interrupting the gentle trend of the sides of the basin is the LaSalle anticline, running from the vicinity east of LaSalle, Illinois, in a southeastwardly direction to Sadorus, in Champaign County, Illinois. From thence it passes near Tuscola and enters the main oil fields of Clarke, Crawford and Lawrence counties. From the latter county it continues in a direct line past St. Francisville, Illinois, under the Wabash, and on into Indiana. The Princeton oil area seemingly lies along the anticline. The remaining oil areas of Illinois and Indiana, such as Sparta, Greenville, Sandoval and Centralia of Illinois, and Oakland City of Indiana, lie along terraces or slight folds on the flanks of the basin, not far from its edges. These are thought to be more or less regular deformations in their extensive trend, but perhaps somewhat locally broken or irregular.

Local Structure. The only attempt in this report to show the structural relations of the field is made by use of contours on the No. V coal in the accompanying field map. These were taken from the Ditney Folio of the U. S. Geological Survey. They show the position of the coal above sea level in 400 and 450-foot contour lines. Where the lines assume a dash appearance, the coal has disappeared by erosion and its position has been determined by out-

*Ashley, Geo. H., The Eastern Interior Coal Field, Twenty-second Ann. Rep. U. S. Geol. Surv., pt. 3, 1900-1901, pp. 265-305.

cropping. The irregularity of the contours and the distance separating them indicate the approximate structure. The area in the northern loop of the 400-foot contour represents a high place in the coal and a corresponding one in the lower formations. This includes sections 9 and 10 of T. 2 S., R. 8 W. A further study of the coal outcrops on the Ditney Folio shows a low spot on the west side of the second loop of the 400-foot contour. This includes sections 16 and a part of 15 of T. 2 S., R. 8 W., and should be avoided in prospecting. The area north of the town of Arthur, Section 13, T. 2 S., R. 8 W., indicates a broad, flat place in the coal, showing only a mild rise. The structure seems to be a terrace, and would naturally serve as a collecting ground for oil and gas. The salt water has probably found its way by gravitation into the western slope of the basin and, through the relative gravities of water, oil and gas, crowded the latter two into the terrace, where they were trapped and held captive by pressure. The salt water to the east of the field has, perhaps, repeated the action in another terrace farther up the sides of the basin. Therefore, judging from the present development, the area toward Ayrshire seems suggestive of oil and gas accumulation.

The prominent feature of the contouring is the knob-like figure described by the 450-foot contour, including portions of sections 23, 26, 25 and 35 of T. 2 S., R. 8 W. This is a notable example of the use of structural diagrams in locating oil and gas areas. The area within the "knob" is a high place in the formations and would indicate a gas accumulation in the oil and gas bearing horizons. This is proven to be a correct assumption by the presence of good gas wells in or close to the indicated deformation. The areas to either side of the neck of the "knob" are low places in the structure and hence are not favorable to accumulation.

Prospective Areas. The areas appearing to be favorable to the accumulation of oil and gas upon the accompanying map lie in a northwest extension of the northern end of the present field, reaching into the loop of the 400-foot contour; a northeastward trend of the same pool toward Ayrshire, and a more thorough investigation of the so-called "knob" in sections 23, 26 and 35 of Monroe Township might develop some paying wells.

Several suggestive areas, indicated by contouring on the Ditney Folio, are as follows: (1) In and about the town of Winslow and slightly to the northwest of it, comprising sections 31 and 32 of T. 1 S., R. 7 W., and sections 25 and 36 of T. 1 S., R. 8 W.

(2) Sections 16, 17, 18, 19, 20, 21 and 22 of T. 1 S., R. 8 W.,

two or three miles northwest, north and northeast of the town of Glezen.

(3) The area, two miles in extent, southwest of Littles, seems to show considerable irregularity in structure. Sections 27, 33 and 34 of T. 1 S., R. 8 W.

(4) The area in sections 16, 17, 20, 21, 22, 27, 28, 29 and 33 of T. 3 S., R. 7 W.

(5) The area east and southeast of Boonville, in sections 5, 6 and 7 of T. 6 S., R. 7 W.; sections 20, 19, 30, 29 and 31 of T. 5 S., R. 7 W.; sections 25 and 36 of T. 5 S., R. 8 W., and sections 1, 2 and 12 of T. 6 S., R. 8 W.

Stratigraphy. The stratigraphic comparisons of the Oakland City oil logs with those of other localities in the Eastern Interior Coal Basin are shown in Plate I. The illustration was made from the following detailed logs:

No. 1.* *Old Sparta Gas Well, No. 2, near Sparta, Randolph County, Illinois. Location: N. E. quarter S. E. quarter, Section 2, T. 5 S., R. 6 W.*

	Thickness, Feet.	Depth, Feet.
Drift	57	57
Limestone	4	61
Coal (No. 7?)	3	64
Shale	25	89
Limestone	12	101
Coal (No. 6)	6	107
Fire clay	2	109
Clay shale	20	129
Limestone	12	141
Shale	8	149
Coal (No. 3?)	4	153
Clay shale	15	168
Sandstone	200	368
Clay shale	20	388
Limestone	40	428
Shale	20	448
Sandstone	25	473
Caving soapstone	15	488
Limestone	64	552
Shale	22	574
Sandstone	10	584
Shale	20	604
Limestone	10	614
Conglomerate	16	630
Caving red rock	15	645

*Nickles, J. M., Rept. Ill. Board Worlds Fair Commissioners. 1893, p. 191.

	Thickness, Feet.	Depth. Feet.
Shale	10	655
Limestone	20	675
Sandstone	38	713
Clay shale	67	780
Limestone	20	800
Clay shale	22	822
Sandstone	5	827
Dark gray stone	6	833
Shale	21	854
Limestone	14	868
Shale	48	916
Limestone	4	920
Red shale	40	960
White sandstone	18	978
Red shale	16	994
Limestone	5	999
Red sandstone	11	1,010
Red shale	2	1,012
Salt water sandstone	13	1,025

No. 2. *Greenville Gas Area. S. T. Henry, well No. 1, drilled by the Summerfield Gas Co. Authority, F. T. Rowland. Location: N. W. quarter, S. E. quarter, S. E. quarter, Section 15, T. 5 N., R. 3 W., near Greenville, Bond County, Illinois.*

Clay	30	30
Sandy shale	80	110
Loose sand (water)	15	125
Shale	15	140
Sand	3	143
Shale	10	153
Sandy shale (water)	10	163
Shale	8	171
Loose sand (water)	9	180
Hard sand	6	186
Shale (water)	20	206
Shale	30	236
Shale	80	316
Sand	49	365
Shale	10	375
Sand (water)	13	388
Shale	15	403
Hard sand	5	408
Soft shale	5	413
Lime (water)	5	418
Muck	5	423
Shale, black	7	430
Shale, white	5	435
Lime	6	441

	Thickness, Feet.	Depth, Feet.
Shale, black	8	449
Shale, white	5	454
Shale, black	5	459
Coal	2	461
Shale	5	466
Sand	5	471
Shale	14	485
Shale	3	488
Shale	5	493
Sand (water)	42	535
Shale (black)	5	540
Shale (white)	43	583
Coal	4	587
Shale (white)	40	627
Shell	3	630
Shale (black)	10	640
Shale (white)	20	660
Shale (dark)	10	670
Coal	5	675
Shale	45	720
Sand (water)	45	765
Shale	5	770
Sand	10	780
Shale	24	804
Lime	8	812
Shale	8	820
Limestone	12	832
Shale	5	837
Red rock	15	852
Shale	28	880
Lime shell	4	884
Shale	5	889
Lime	16	905
Shale	12	917
Shale	12	929
Lime	15	944
Shale	16	960
Red rock	12	972
Shale	10	982
Red rock	8	990
Sand	35	1,025
Shale	6	1,031
Sand (no water)	8	1,039
Lime	6	1,045
Lime and sand shells	17	1,062
Lime shell	2	1,064
Sand	3	1,067
Sand (water)	..	1,079

Dry well

No. 3. *Sandoval Oil Area. R. Benoist, No. 1, drilled by Treat and Crawford. Authority, A. M. O'Donnel. Location: N. E. quarter of N. W. quarter, Section 8, T. 2 N., R. 1 E., near Sandoval, Marion County, Illinois.*

	Thickness, Feet.	Depth, Feet.
Soil	..	153
Shale	39	192
Lime (water)	12	204
Shale	341	545
Lime	25	570
Coal	6	576
Shale and shells	54	630
Sand	10	640
Shale	30	670
Sand	45	715
Shale and shells	105	820
Sand	10	830
Shale	10	840
Lime	5	845
Slate	35	880
Sand (water)	17	897
Shale	20	917
Sand	43	960
Shale	25	985
Lime	15	1,000
Shale	33	1,033
Lime	12	1,045
Shale	45	1,090
Sand	10	1,100
Slate (cave)	25	1,125
Sand (water)	42	1,167
Shale	28	1,195
Lime	20	1,215
Shale	25	1,240
Sand (water)	15	1,255
Lime	15	1,270
Shale	5	1,275
Lime	15	1,290
Shale	20	1,310
Lime	5	1,315
Shale	5	1,320
Lime	30	1,350
Sand	15	1,365
Shale	5	1,370
Red rock	5	1,375
Shale	15	1,390
Red rock	11	1,401
"Stein" sand (oil 1,401 to 1,408)	37	1,438
Shale	27	1,465

	Thickness, Feet.	Depth, Feet.
Lime	5	1,470
Shale	20	1,490
Red rock	5	1,495
Lime	13	1,508
Gas sand	15	1,523
Lime	6	1,529
Gas sand	9	1,538
Oil sand	28	1,566

No. 4. *Centralia Oil Area. F. Koester No. 1, drilled by the Ohio Oil Co. Authority, W. W. McDonald. Location: N. W. quarter, S. W. quarter Section 3, T. 1 N., R. 1 E., near Centralia, Marion County, Illinois.*

Soil and clay	40	40
Lime	8	48
Shale	77	125
Lime	7	132
Shale	68	200
Shale	390	590
Lime	8	598
Shale	2	600
Lime	10	610
Coal	6	616
Shale	4	620
Lime	5	625
Sand	15	640
Lime	5	645
Shale	10	655
White shale	175	830
Shale and lime	5	835
Coal	10	845
Broken sand	16	861
Shale	54	915
Salt sand	15	930
Shale	20	950
Sand.	10	960
Shale	25	985
Salt sand	100	1,085
Shale	65	1,150
Salt sand	2	1,152
Shale	18	1,170
Sand	50	1,220
Lime	30	1,250
Shale and lime	50	1,300
Shale	40	1,340
Sand	85	1,425
Shale	15	1,440
Lime	10	1,450

	Thickness, Feet.	Depth, Feet.
White shale	20	1,470
Water sand	15	1,485
Red rock	15	1,500
Lime	20	1,520
Shale and lime	40	1,560
Shale	30	1,590
Sand	4	1,594
Shale	11	1,605
Oil sand	20	1,625

No. 5. *Lawrence County, Illinois, Oil Field.* Drilled by The Everson Oil Co. Location: N. E. quarter of the N. E. quarter, Section 36, Christy township, Lawrence County, T. 4 N., R. 13 W., near Bridgeport, Illinois.*

Conductor	12	12
Lime and sand	24	36
Slate	61	97
Slate and lime	43	140
Slate	90	230
Sand	16	245
Slate	15	260
Sand.	54	314
Slate	131	445
Lime	10	455
Slate	200	655
Lime	5	660
Slate and shell	110	770
Sand and water	35	805
Slate	95	900
Upper Bridgeport sand	25	925
Slate and shell	150	1,075
Sand	10	1,085
Slate	25	1,120
Sand and water	25	1,145
Slate	85	1,235
Slate and sand showing of oil and gas Buchanan sand	105	1,340
Sand	70	1,410
Sand	60	1,470
Lime	20	1,490
Slate	10	1,500
Blue and black slate	25	1,525
Blue and black sand	10	1,535
Red rock	8	1,543
Very hard lime	12	1,555
Slate break	5	1,560
Very hard lime	20	1,580
Slate	40	1,620

* Published on page 296 of Bull. 8, Ill. State Geol. Surv.

	Thickness, Feet.	Depth, Feet.
Lime	20	1,640
Black slate	40	1,680
Top of oil sand	..	1,680
Bottom of oil sand	50	1,730

No. 6. *Lawrence County, Illinois Oil Field. E. Fyffe No. 7 well, drilled by the Snowdon Bros. Oil Co. Location: N. E. quarter of the N. E. quarter, Section 1, Bridgeport township, Lawrence Co., Illinois, T. 3 N., R. 13 W.*

Sand (water)	90	200– 290
Sand (water)	80	310– 390
Lime shell	8	402– 410
Red rock	5	412– 417
Sand	25	450– 575
Coal	3	578
Sand	30	790– 820
Sand (water)	20	900– 920
Hard shell	3	930– 933
Limestone	30	970–1,000
Sand (water at 1,145)	130	1,110–1,240
Sand	25	1,275–1,300
Limestone	35	1,305–1,340
Sand	25	1,345–1,370
Sand (water)	23	1,440–1,463
Red rock	8	1,499–1,507
Limestone	20	1,529–1,549
Sand (water)	12	1,567–1,579
Limestone	22	1,601
Sand	32	1,633–1,665
First oil from	..	1,641–1,665

No. 7. *Princeton, Indiana, Oil Area. Chas. Brownlee farm, drilled by the Interstate Oil and Gas Company. Location: South half S. W. quarter, Section 6, T. 2 S., R. 11 W., near Princeton, Gibson County.*

Drift	40	...
Soapstone	75	115
Coal	3	118
Fire-clay	4	122
Limestone	10	132
Soapstone	148	280
Limestone	35	315
Shale and mud	35	350
Slate	20	370
Limestone shale	1	371
Slate	14	385

*Blatchley, Raymond S., The Princeton Petroleum Fields of Indiana, Thirty-first Ann. Rep. Dept. Geol. and Nat. Reso. of Ind., 1906, pp. 559–593.

	Thickness, Feet.	Depth, Feet.
Coal	7	392
Blue mud	43	435
Slate	15	450
Asphalt (?)	6	456
Limestone	30	486
White sand	6	492
Limestone	35	527
Shale	45	572
Slate	15	587
Coal	5	592
Fire-clay	5	597
Sand	15	612
Slate	6	618
Shale	5	623
Gray sand	20	643
Shale	36	679
Limestone	13	692
Coal	7	699
Shale	40	739
Gas sand	12	751
Shale	18	769
Sandstone	100†	869
Shale	25	894
Sandstone	100	994
Shale	5	999
Gray sand	30†	1,029
Asphalt base (?)	25	1,054
Shale	125	1,179
Gray sand	20	1,199
Salt water sand	15	1,214
Shale	45	1,259
Sand	40	1,299
Limestone and shale	20	1,319
Hard stone	84	1,403

No. 8. *Oakland City Oil Area. C. D. Houchins No. 1, drilled by M. Murphy. Location: In Section 15, T. 1 S., R. 8 W.*

This record is presented on page 120.

No. 9. *Oakland City Oil Area. Joel Skinner well No. 1, drilled by Gibson and Cox. Location: In Section 3, T. 3 S., R. 8 W.*

This record is presented on page 107.

No. 10. *Oakland City Oil Area. Sarah E. Cooper No. 1 well. Location: N. W. quarter, Section 23, T. 2 S., R. 8 W.*

This record is presented on page 117.

†Oil.

The method of study used in the above plate was to plot the various records to a uniform vertical scale, one inch being equivalent to 100 feet, and using the same symbols throughout for the different formations. The top limestone of the Huron or Chester rocks was used as a basis for arranging the logs. After the plate was made, correlation lines were drawn between like formations.

The general stratigraphic section of all the fields first shows some drift or other disintegrated surface formation overlying the hard rocks, followed by the extensive series of Pennsylvanian and Mississippian rocks.

The drift was shown in records 1, 3, 4 and 7, with considerable variation in thickness. This is not essential in this study. The average drift on the Oakland City field, however, is about 50 feet.

The Pennsylvanian or "Coal Measure" rocks are distinguished by the presence of coals, interbedded with shale, limestone, and an occasional stratum of sandstone. The lower part of these rocks, characterized by an extreme thickness of massive sandstone, is obviously of the Mansfield sandstone or Pottsville age and in the Indiana records is known as the Mansfield sandstone. It marks the base of the Carboniferous series. At Sparta, along the southwestern rim of the basin, the upper division of the Pennsylvania is only 107 feet thick. This increases to about 700 feet at Greenville, in Bond County, Illinois, lying near the western edge of the basin. The thickness of the coal measures increases as the approach is made toward the center of the basin, varying from 700 to 2,200 feet. Along the eastern rim of the basin, near Oakland City, they become thin, averaging about 500 feet in that field. The Mansfield or Pottsville sandstones are the equivalent of the oil sand of Litchfield, Illinois, the Buchanan sand of the main Illinois fields, the Princeton, Indiana oil sand and the salt sand of the Oakland City field, overlying the producing sand. They maintain an extreme thickness of from 200 to 550 feet in records Nos. 1 and 4 to 10, inclusive. In record No. 2 they are very thin, owing to the wedging out toward the western rim of the basin.

The Mississippian rocks next underlie the Pennsylvanian, and are the most important in the Eastern Interior Basin, in that they are widely productive of oil. This series of rocks comprises what is known as, first, the Huron or Chester rocks, followed by the massive limestones known as the Mitchell, Oölitic and Harrodsburg limestones, which are an equivalent of the St. Louis and Spergen limestones of Illinois. None of the columnar sections show the formations below the Huron rocks.

The top limestone of the Huron rocks, and consequently of the Mississippian, is the first underlying the massive Mansfield or Pottsville sandstones. It was used in the above plate as a basis of arrangement. The remaining rocks of the Huron or Chester formation are characterized by alternating limestones, red shales—otherwise known as "red rock"—sandstones and some shale. The strongest markers of the presence of these rocks are the red shales. They particularly indicate the position of the productive oil horizons, and are becoming widely used by oil men as a guide in drilling.

The Huron or Chester series is notable for its areal extent over the basin and also as being widely productive of oil. In Illinois it contains the Sparta oil sand of Randolph County; the Lindley gas sand of Bond Township; the Benoist sand of Sandoval and the productive sand around Centralia, both locations in Marion County; the Kirkwood, Tracy, green sand, and McCloskey sands of Lawrence County. The productive sand of the Oakland City field, in Pike County, Indiana, belongs to the same formation.

The Oakland City sand is easily correlated with the Huron or Chester sands producing oil in Illinois, both by the presence of red shales and by its position, underlying the massive Pottsville sandstone. Records 8, 9 and 10 indicate the relations.

The Tracy, McCloskey and green sands of the main Illinois fields underlie the Kirkwood and are, in reality, sandy limestones, yielding oil obviously of limestone origin, since it gives a strong and offensive odor of sulphur gas. One well in the Oakland City field, in the southwest quarter of the northwest quarter of Section 13, Patoka Township, was reported to have reached a sand lower than the Oakland City sand, and to yield an oil of good gravity and of strong sulphur smell. The Oakland City sand in this well was found at 1,171 feet and was 10 feet thick. The second lens was found at 1,228 feet and was 8 feet thick. The two lenses yielded an initial production of 150 barrels. The stray sand was found at a lower depth at 1,284 feet, and was reported to be 18 feet thick, yielding the sulphur oil. This seems comparable to the Tracy sand of the Illinois field and will be held as a tentative conclusion until further information is secured.

PRESENTATION OF LOGS.

Section 26, Monroe Township (T. 2 S., R. 8 W.)

On the J. Yager lease, where the original well was drilled, there are four producing wells making 80 barrels daily. The record of No. 1 is as follows:

Record of Yager No. 1 Well.	Thickness, Feet.	Depth, Feet.
Surface, mud, loam and quicksand	52	52
Coal measures, shale, coal, etc.	408	460
Sandstones (Mansfield and Huron) salt water	410	870
Limestone	30	900
Shale	15	915
Limestone	40	955
Shale	10	965
Limestone	70	1,035
Shale	5	1,040
Limestone	54	1,094
Shale	46	1,140
Limestone and shale	41	1,181
Total depth		1,181

The last stratum in the above record is what is known to oil men as the oil bearing sand. The first gas was found at 1,148 feet and the first oil at 1,162 feet, the pay streak continuing unbroken to the bottom. Between 1,174 and 1,178 feet the well filled up 400 feet in one hour. The drilling was stopped at 1,181 feet, the sand at that depth getting white and looking wet. The record of the iron used in the well is as follows:

Casing—	Feet.
13 -in.	52
10 -in.	303
8 -in.	960
6¼-in.	1,074

This well flowed 30 barrels a day natural, i. e., without being shot, for a long while. About a year and a half after it was drilled in, it was shot and produced 100 barrels a day for several months.

No. 2 was drilled in, August 20, 1909, and gave the following partial strata record:

	Feet.
Salt sand, (broken at intervals by shale formation)	580– 950
Lime	1,058–1,108
Red rock	1,129–1,136
Gas sand	1,150
Oil sand	1,175

	Feet.
First pay	1,175
Second pay	1,180
Total depth	1,185

The casing record is:

Casing—	Feet.
10-in.	90
8¼-in.	370
6¼-in.	1,058

The well was shot with 80 quarts of nitroglycerine.

No. 3, drilled in, January 2, 1910, on the same lease, has the following record:

	Feet.
Lime	1,056–1,096
Oil sand	1,156–1,190
Total depth	1,194

Casing—	Feet.
10-in.	63
8¼-in.	360
6¼-in.	1,060

The only well on the M. Burnett lease, southwest quarter of the northeast quarter of the section, is the gas well. The record kept of this well is not complete. Only the formations important as casing points or markers were kept. The partial record is as follows:

M. Burnett Gas Well.	Thickness, Feet.	Depth, Feet.
First coal	7 at	85
Water and coal, second vein	.. at	170
Sand	10 at	240
Sand and water	15 at	290
Limestone	8 at	313
Sandstone	20 at	340
Sandstone	10 at	480
Sandstone	40 at	520
Lime	6 at	642
Sandstone	35 at	770
Sand with water	35 at	835
Limestone shell and slate	165 at	870
Red rock	8 at	1,035
Limestone	37 at	1,053
Red rock	10 at	1,090 to 1,100
Top of oil sand	1,134	
Showing of oil	1,143	
Gas pay	1,146 to	1,151
Depth		1,152

The casing record here was:

Casing—	Feet.
12½-in.	62
10 -in.	636
8¼-in.	790
6¼-in.	1,053
3 -in. tubing	1,153

This well had a capacity of 5,000,000 cubic feet of gas daily, and at the start a rock pressure of 525 pounds.

The South Fork Oil Company; which owns the fee simple of what is known as the Machine Forty, just west of the J. Yager lease, northwest quarter of southwest quarter of Section 26, is operating with five producing wells. The following is the record for the same:

South Fork Oil Company Lease.

Date—	No. 1. May 28, 1909. Feet.	No. 2. July 11, 1909. Feet.	No. 3. Dec. 15, 1909. Feet.	No. 4. ——— Feet.	No. 5. May 27, 1910. Feet.
Casing—					
10-inch	.....	82	83	63	95
8½-inch	.....	370	335	335	325
6¼-inch	1,073	997	1,160	1,088	1,072
Shot	60 qts.	60 qts.	140 qts.	180 qts.	.....

No. 1 is reported as having the following sand record:

	Feet.
Hard shell	1,145–1,149
Sand	1,149–1,178
Gas	1,142–1,145
Best oil	1,160–1,170
Total	1,178

No. 2:

Lime	997–1,058
Gas sand	1,150–1,154
Slate	1,154–1,160
Top oil sand	1,160
Shell and sand	1,160–1,189
Later drilled to (total)	1,198

No. 3:

First sand, brown	1,156–1,175
No gas.	
Best oil	1,158–1,175
Slaty break	1,175–1,181
Slate and second sand	1,191–1,194
Total	1,194

No. 4:

Sand	1,166–1,196*
Total	1,196

No. 5:

Gas sand	1,144–1,152*
Oil sand	1,152–1,190
Total	1,192

*No gas.

This lease, during the fall of 1910, produced 35 to 40 barrels daily.

On the Warrick Mason lease, southeast quarter of the southwest quarter of Section 26, Murphy & Co. are operating six wells, producing 105 barrels daily in November, 1910. The following is a record of five of them:

W. Mason Lease.

Date—	No. 1. Mar. 13, 1909. Feet.	No. 2. Sept. 21, 1909. Feet.	No. 3. Feet.	No. 4. Jan. 29, 1910. Feet.	No. 5. Mar. 22, 1910. Feet.
Salt sand	600– 800	580– 765	575–850	.....	580– 875
Limestone	1,067–1,104	1,075–1,120	1,081–1,121	1,078–1,118	1,080–1,120
Red rock	1,110–1,130	1,135–1,150	1,140–1,147	.....	1,140–1,150
Oil sand	1,150–1,178	1,162–1,200	1,167–1,200	1,157–1,188	1,173–1,198
First pay at	1,164	1,175	.....	.....	.....
Second pay at	1,171	1,190	.....	.....	.....
Total	1,178	1,205	1,203	1,190	1,202
Casing—					
10-inch	50	.....	65	50	.....
8¼-inch	550	.....	325	355	.....
6¼-inch	925	.....	1,081	1,078	.....
4⅓-inch	1,080	.....	.....	.....	.....
Shot	.....	120 qts.	.....	.....	.....
Initial production	35 bbls.	180 bbls.	.....	.....	.....
Production after being shot	90	.....	.....	.....	.....

On the [illegible] southwest quarter of southeast quarter of Section 26, Wayne Township, there are three wells put down by various days. The following is a record of these wells:

Data Concerned—	[illegible] Feet.	[illegible] Feet.	[illegible] Feet.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total depth	1,159	1,200	1,197
Casing—			
10-inch	56	77	59
8-inch	420	875	380
6¼-inch	1,095	1,075	1,080
Shot	120 qts.	140 qts.	140 qts.
Initial production	170 bbls.	107 bbls.	.....
Present production	.....	50 bbls.	.....
Casing, 12½-inch	.....	180 feet	.....

On the northwest corner of this lease there is a large power pumping the thirteen wells of the J. Yager, W. Mason and the Johnson leases.

Four wells on the Ferris property, southwest quarter of the southwest quarter of Section 26, were yielding 25 barrels daily. The following is a record of these wells:

Date—	No. 1. Jan. 9, 1910. Feet.	No. 2. Mar. 12, 1910. Feet.	No. 3. May 12, 1910. Feet.	No. 4. June 16, 1910. Feet.
Casing				
10-inch	102	65	65	74
8-inch	467	*	*	358
6¼-inch	1,084	1,079	1,083	1,093½
Sand at	1,160	1,169	1,165	1,175
Thickness of sand	29	25	25	25
Total	1,189	1,194	1,195	1,200
Shot	100 qts.	100 qts.	120 qts.	100 qts.

*Not given.

No. 1 yielded 100 barrels, natural, the first 24 hours, and 170 barrels the second 24 hours. When the well was rigged up and regulated to a 36-inch stroke it made 180 barrels in 24 hours.

On the P. S. Mason lease, southwest quarter of the southwest quarter of Section 26, there are two producing wells and one dry hole, with the following record for Nos. 2 and 3:

Date—	No. 2. Mar. 16, 1910. Feet.	No. 3. Feet.
Lime	1,059–1,109	1,070–1,090
Broken formation	1,164–1,169	.....
White sand	1,179–1,185	1,168–1,173
Oil	1,185–1,189	1,173–1,195
Total	1,192	1,198
Casing—		
10-inch	60	57
8¼-inch	315	297
6¼-inch	1,059	1,070
Shot	120 qts.	.....
Conductor	.....	14

The Ohio Oil Company drilled a dry hole on the H. Yager farm, northeast quarter of the southeast quarter of Section 26, Monroe Township, defining the eastern edge of the pool in this section. Below is the pipe record of this bore:

Casing—	Feet.
10-in.	28
8¼-inch	360
6¼-in.	1,070
Top of sand	1,184
Total depth	1,224

On the C. Carlisle farm, northwest quarter of Section 26, Monroe Township, there are three producing oil wells and one gas well. The three wells were yielding, in November, fifteen barrels daily.

Two gas wells complete the list of wells in Section 26, Monroe township, one on the English farm, northeast quarter of the northwest quarter, and the other on the Wm. Harbison farm, on the northeast quarter of the northeast quarter. The following is a record of the latter:

Casing—	Feet.
10-in.	27
8¼-in.	350
6¼-in.	1,050
Some oil at	1,154
Oil sand	1,154–1,165
Limestone	1,165–1,176
Shale	1,176–1,182
Gas	1,182–1,186

Section 35, Monroe Township, T. 2 S., R. 8 W.

In the northwest quarter of the northwest quarter of Section 35, to the south of Section 26, on the Stella Black farm, there are two wells. No. 1 has the following record:

	Feet.
Limestone	1,080–1,120
Oil sand	1,182–1,202
Lime	1,202–1,207

Casing—	Feet.
10-in.	66
8¼-in.	400
6¼-in.	1,080

Completed January 31, 1910.

On the T. H. Coleman farm, southwest quarter of the northwest quarter of Section 35, Monroe Township, there is one producing well.

The Ohio Oil Company operates four wells on the northeast quarter of the same section on the W. D. Mason farm, with the following record:

W. D. Mason Lease.

Date—	No. 1. July 24, 1909. Feet.	No. 2. Dec. 3, 1909. Feet.	No. 3. Feb. 25, 1910. Feet.	No. 4. Feet.
Casing—				
10-inch	52	73	91	81
8¼-inch	425	408	380	400.
6¼-inch	1,080	1,070	885	1,074
Top of sand	1,160	1,176	1,169	1,167
Oil at	1,170	1,180	.....	1,169
Best oil at	1,178	1,185	.....	.....
Total	.....	1,196	1,195	1,198
Production first 24 hours	250 bbls.	75 bbls.	70 bbls.	.....
Second 24 hours	250 bbls.	50 bbls.	.....	.....
Shot	140 qts.	60 qts.	80 qts.	100 qts.

On the T. J. Hurt lease, northeast quarter of the northwest quarter of Section 35, there are two wells producing about 18 barrels daily.

On the E. H. Ashby lease, in the same quarter section, there are two wells, one producing and one abandoned well, which had a showing of oil. Below is the record of these wells:

Wells on E. H. Ashby Lease.

Casing—	No. 1. Feet.	No. 2. Feet.
10 -in.	70	75
8¼-in.	..	400
6¼-in.	1,050	1,070
4¾-in.	1,167	...
Top of sand	1,167	1,175
Oil at	1,176	...
Best oil	1,185	...
Total	1,209	1,229

Production, No. 1, first 24 hours, 100 bbls.; second 24 hours, 75 bbls.
No. 2, dry hole.
No. 1 was completed on October 19, 1909, and No. 2 on November 27, 1909.

On the J. McKinney lease, southeast quarter of the northeast quarter of the section, a dry hole was drilled. There was also another on the E. Conner lease, northeast quarter of the southeast quarter of the section.

Section 36, Monroe Township (T. 2 S., R. 8 W.).

In this section the drilling has been confined to two dry holes. One on the Thos. Jordan lease, northeast quarter of southwest quarter of the section was drilled to a depth of 1,300 feet. The other, on the L. Lemasters farm, in the northeast quarter of the section, gives the following record:

Dry Hole on the L. Lemasters Farm.	Feet.
Salt sand	725– 875
Limestone	1,095–1,123
Red rock	1,160–1,180
Oil sand	1,210–1,220
Yellow sand	1,220–1,230
Lime	1,230–1,238
Shale	1,238–1,252
Sand (salt water)	1,252–1,340
Sandy lime	1,340–1,405
Hard lime (Blue Lick water running over top)	1,405–1,500
Blue shale	1,500–1,503
Gray and brown lime	1,503–1,625

The pipe record is as follows:

Pipe, 12½-in.	55
Casing—	
10 -in.	370
8¼-in.	875
6¼-in.	1,390

Section 34, Monroe Township (T. 2 S., R. 8 W.).

The only test in this section was a dry hole on the Morgan farm, northwest quarter of the northwest quarter of the section, giving the following record:

Record of Bore on the Morgan Farm.

(Drilled March 26, 1909.)

Strata.	Thickness, Feet.	Depth, Feet.
Mud and slate from top	..	370
Sand containing some gas	30	400
Mud	25	425
Sand	25	450
Mud	130	580
Salt sand and water	70	650
Slate	20	670
Sand	30	700
Slate	20	720
Sand	80	800
Mud	75	875
Limestone	10	885
Mud	25	910
Sandstone	40	950
Mud	15	965
Sandstone	105	1,070
Mud	15	1,085
Lime rock, hard	30	1,115
Broken sand	65	1,180
Hard lime rock	20	1,200
Slate and red rock	15	1,215
Salt sand and water	93	1,308
Total depth		1,308

The casing record is as follows:

Casing—	Feet.
10 -in.	105
8¼-in.	469
6⅝-in.	1,126

This bore was the farthest southwest one put down in the field, and with the Gillum well, three-quarters of a mile north and a half mile west, proves the running out of the pool in this direction.

Section 3, Monroe Township (T. 3 S., R. 8 W.).

Among the early wildcat bores drilled soon after the drilling of the Yager No. 1 well, was one by Gibson & Cox on the Joel Skinner lease, northeast quarter of the northeast quarter of Section 3, Monroe Township. This location was about a mile and a quarter south and a half mile west of the Yager No. 1. The result was a dry hole with a very small showing of oil. The record is as follows:

	Thickness, Feet.	Depth, Feet.
Clay	20	20
Shale	60	80
Sand-water	5	85
Shale	50	135
Sand	80	215
More water at	..	150
Shale	135	350
Coal	2	352
Shale	168	490
Shelly limestone	30	520
Sand	40	560
Shale	10	570
Sand and water	20	590
Shale	40	630
Salt sand	205	835
Shale	75	910
Sand (water 920)	25	935
Sandy lime	25	960
Shale	10	970
Pure black shale	25	995
Rotten shale	5	1,000
Slate	45	1,045
Limestone	8	1,053
Sandy slate	10	1,063
Lime	23	1,086
Sand and water	13	1,099
Slate	11	1,110
Slate	5	1,115
Red rock	5	1,120
Slate	5	1,125
Red rock	8	1,133
Slate	24	1,157
Lime	45	1,202
Shale	12	1,214
Red rock	5	1,219
Black shale	15	1,234
Sandstone shells	3	1,237
Sand, dry (oil showing)	8	1,245

	Thickness, Feet.	Depth, Feet.
Sand	6	1,251
Break of muddy shale	3	1,254
Sand, oil showing	11	1,265
Sand, salt water	15	1,280
Lime	10	1,290
Slate	15	1,305
Sand	7	1,312
Slate	21	1,333
Sandy shale	10	1,343

At 1,343 feet water was struck which flowed over the top of the hole and the well was abandoned.

Section 2, Monroe Township (T. 3 S., R. 8 W.).

The only attempt in this section was on the Grubb farm, fully two miles south of any production. The result was a dry hole, with the following record:

Dry Hole on the Grubb Farm.

	Feet.
Red rock	1,125–1,140
Limestone	1,140–1,182
Shale	1,182–1,242
Limestone	1,242–1,260
Shale	1,260–1,305
Limestone	1,305–1,345
Shale	1,345–1,375
Sand	1,375–1,385
Limestone	1,385–1,388
Blue lick	1,388–1,392

Casing—	Feet.
10 -in.	67
8¼-in.	400
6¼-in.	940
4⅞-in.	1,098
Total	1,392

Section 28, Monroe Township (T. 2 S., R. 8 W.).

The only drilling in this section was a test bore on the Gillum lease, southwest quarter of the section, two miles west of the Yager well, which came in a dry hole, with the following record:

Record of Bore on the Gillum Lease.

	Feet.
Drive pipe, 10-in.	50
Casing—	
8¼-in.	330
6¼-in.	1,120
Top of sand	1,186
Total depth	1,210

Here a four-foot vein of coal was passed through at a depth of 154 to 158 feet; another one of six feet thick at 190-196 feet, and a five-foot vein of red rock at 1,174 feet.

On the J. F. Cato farm, northeast quarter of the northeast quarter, there are three very light producing wells.

Section 27, Monroe Township (T. 2 S., R. 8 W.).

On the J. Yager farm, southeast of the southeast quarter of Section 27, there have been three bores put down. Two of these are fair producing wells and the third a light producing well.

On the Ettie Simpson lease, southwest quarter of the southeast quarter of Section 27, Monroe Township, there are two wells. The record of No. 1 is as follows:

	Feet.
Wood conductor	20
Casing—	
10 -in.	83
8¼-in.	404
6¼-in.	1,065
Small vein of coal at	75
Four feet of coal at	210
Salt sand	515
Oil sand	1,167
Total depth	1,185

On the J. S. Kays farm, northeast of southwest quarter of Section 27, there was a bore put down which was practically a dry hole, but with a showing of oil. The record of this well is as follows:

Record of Well on J. S. Kays Farm.

(Completed August, 1910.)

	Feet.
Limestone	1,064–1,098
Oil sand	1,155–1,177
Casing—	
10 -in.	33
8¼-in.	360
6¼-in.	1,064

On the J. E. Mason lease, northeast quarter of the southeast quarter of Section 27, Monroe Township, Murphy & Co. drilled in one fair producing well, with the following record:

(Date completed, May 10, 1909.)

	Feet.
Lime	1,080–1,116
Shale	1,116–1,142
Top of sand at	1,142
First pay at	1,161
Most oil at	1,166
Total depth	1,173
Shot	60 qts.

At 1,161 feet, where first pay was reached, the oil filled to 30 feet above the tools. The drilling was stopped in the sand when the latter began to look like water sand. The casing record of this well is:

	Feet.
Wooden conductor	14
Casing—	
10 -in.	70
8¼-in.	455
6⅝-in.	1,081

On the T. J. English farm, southeast of northeast of Section 27, one well with an initial production of 40 barrels, was put down, with the following record:

(Drilled April 9, 1909.)

Casing—	Feet.
10 -in.	75
8¼-in.	460
6⅝-in.	1,080
Sand	1,136 –1,154½
Oil showing	1,154½
Shale break	1,154½–1,171
Pay sand	1,171 –1,177
Shot	100 qts.

Drilling was stopped in sand which was running white but was shot into water. This well has recently been abandoned.

The Amelia Skinner lease, southeast quarter of northeast quarter of the section and one-half mile northwest of the Yager well, there are three producing wells. The record of No. 1, completed December 25, 1908, and therefore the third producing well in the field, is as follows:

	Feet.
Drive pipe, 10-in	60
Casing—	
8¼-in.	417
6¼-in.	1,067
Depth to top of sand	1,130
Depth to pay sand	1,139
Total depth	1,178
Initial production, bbls	100

Gas was found in the sand between 1,130 and 1,139 feet. From 1,139 to 1,169 feet the sand was quite porous, and between these depths most of the oil was produced. This well made 2,350 barrels of oil from the time it was drilled in, up to May, 1909, when the Pure Oil Company put in its pipe line.

On the H. Henning lease there are six wells producing 40 barrels daily. The following is a record of three of these:

Date Completed—	No. 1. June 23, 1909. Feet.	No. 2. Dec. 2, 1909. Feet.	No. 3. Feet.
Salt sand	.....	490–1,015	.....
Limestone	1,072–1,102	1,075–1,100	1,063–1,091
Red rock	1,115–1,121	1,115–1,120	1,110–1,120
Gas sand	1,134–1,146	1,129–1,146	.....
Oil sand	1,160–1,173	1,153–1,170	1,133–1,170
Oil at	1,160	1,158	1,162
Total	1,173	1,170	1,170
Fresh water	.....	100	.....
Wood conductor	12	.....	.....
Casing—			
10-inch	70	72	50
8¼-inch	400	330	335
6¼-inch	1,072	1,075	1,066

In the northwest quarter of the northeast quarter of the Grant Black lease there are three wells, the record of two of them showing:

Record of Wells on the Grant Black Farm.

Date Completed—	No. 2. Apr. 11, 1910. Feet.	No. 3. Feet.
Salt sand	525– 700	520– 895
Limestone	.....	1,172–1,102
Red rock	1,115–1,125	none
Gas sand	1,135–1,140	none
Shaly break	1,140–1,155	.....
Oil sand	1,155–1,170	1,151–1,171
Total	1,170	1,171
Casing—		
10-inch	46	96
8¼-inch	330	330
6¼-inch	1,073	1,076

On the J. B. Cato lease, northwest quarter of Section 27, Monroe Township, there are three small producing wells. An incomplete record of Well No. 1, furnished by Wm. E. Thompson, contractor, showed: Wooden conductor, 15 feet to sandstone; 89 feet of 10-inch casing through sand to shale. Passed through a small vein of coal at 70 feet; 383 feet of 8¼-inch casing through shale and sandstone formations and cavy, rotten shale to solid shale; 1,072 feet of 6¼-inch casing, through 400 feet of salt sand to almost 900 feet, and then through breaks of shale and limestone shells to more than a thousand feet, and through three limestone formations from 12 to 15 feet in thickness, with breaks between 1,072 feet, where the 6¼ was placed on 15 feet of limestone. The formation was a brown slate to within 6 feet of the oil sand, when a black shale was passed through. Twenty-one feet of pay sand was found at a depth of 1,165 feet 6 inches. The well was drilled two feet below pay into salt sand when the well partly filled up with water. This lease was producing 10 barrels daily in November, 1910.

Section 21, Monroe Township (T. 2 S., R. 8 W.).

On the English farm, southeast of southeast of the section, there are three wells producing five barrels daily.

On the southeast corner of the above quarter section, on the English five-acre lease, there is one small producing well.

On the Kohlmyer lease the Crescent Oil Company, a local company, is operating two wells whose record is as follows:

	No. 1. Feet.	No. 2. Feet.
Casing—		
10-inch	100	100
8 -inch	480	495
6¼-inch	1,082	1,082
Sand	1,151–1,172	1,146–1,168
Total	1,172	1,168
Shot	80 qts.	80 qts.

No. 1 made a little gas and considerable water and No. 2 produced a great deal of gas and some water. The two wells were producing 15 barrels daily in November.

Section 22, Monroe Township (T. 2 S., R. 8 W.).

On the W. Lindsay farm, southwest of southwest of the section, there is one very light producing well. On the W. Shy lease, northwest of southwest of the section, there are two light producing wells and one fair producer, all making 13 barrels daily.

On the Emmaline Miller farm, in the southeast quarter of the southwest quarter of the section, there is one well with the following record:

(Date completed, June 13, 1910.)

	Feet.
Limestone	1,091–1,120
Hard shelly formation	1,151–1,154
Sand	1,154–1,168
Best oil	1,154–1,159
Total	1,169

On the Oliver Mason lease, in the southwest of the southwest, there are two producing wells and two dry holes, with a light showing of oil. The following is a record of No. 1 and No. 4:

Date Completed—	No. 1. Mar. 4, 1910. Feet.	No. 4. Aug. 2, 1910. Feet.
Salt sand	540– 850	.....
Limestone	1,080–1,100	1,076–1,080
Red rock	1,115–1,120	.....
Gas sand	1,142–1,150	1,140–1,150
Oil sand	1,150–1,173	1,115–1,179
Pay	1,165	Small show at 1,175
Total	1,173	1,179
Conductor	12	.....
Casing—		
10-inch	52	81
8¼-inch	340	320
6¼-inch	1,090	1,078

No. 4 was practically dry and was plugged.

On the Emmaline Miller farm, in the southeast quarter of the section and across the east line of the Oliver Mason lease, there are four producing wells making 15 barrels daily.

On the C. D. Houchens lease, northeast of the northeast of the section, a dry hole was put down.

On the Bertha Williams lease, in the northwest quarter of the section, three bores were put down. No. 1 produced some oil and a great deal of gas. No. 2 is a light producing well. The lease was making two barrels daily in November.

Section 23, Monroe Township (T. 2 S., R. 8 W.).

On the McCreary farm, southwest quarter of the southwest quarter of the section, a bore was sunk, with a gas well as the result.

On the S. Thompson lease, north half of the northwest quarter of Section 23, the Ohio Oil Company has put down five holes, with the following results:

Date Completed—	No. 1. Feet.	No. 2. Feet.	No. 3. May 25, 1910. Feet.	No. 4. Aug. 30, 1910. Feet.	No. 5. Feet.
Casing—					
10-inch	25	42	36	28	21
8¼-inch	425	400	345	360	356
6¼-inch	1,070	1,085	1,085	1,097	1,148
4¼-inch	1,161	.....	.....	.....	.....
Top sand	1,143	1,148	1,151	1,181	1,148
Gas	*	1,148	1,155	.....	1,150
Oil	.....	1,154	1,165	1,184	.....
Best oil	.....	1,160	.....	1,221	.....
Total	1,161	1,193	1,188	1,225	1,276
Shot	.....	180 qts.	140 qts.	80 qts.	Dry
First 24 hours	.....	.....	2 bbls.	12 bbls.	.....
Second 24 hours	.....	.....	5 bbls.	.....	.....

*All gas sand.

No. 1 was a gas well.

On the W. S. Burnett farm, southwest quarter of the southeast quarter, Murphy & Co. drilled their second gas well, with the accompanying record:

(Date completed, January 17, 1910.)

	Feet.
Salt sand	530– 900
Limestone	1,065–1,103
Red rock	1,120–1,124
Gas sand	1,135–1,160
Total	1,160
Casing—	
10 -in.	62
8¼-in.	340
6¼-in.	1,068

This well was gauged soon after being drilled, and its volume estimated at 8,000 cubic feet.

On the W. S. Burnett 80 acres, to the north of the above lease, two more gas wells were drilled.

On the F. Butler lease, partly in the southeast quarter of Section 24, there is one gas well and three producing wells. The following is the record for these wells:

Record of Wells on the F. Butler Lease.

Date Completed—	No. 1. Feet.	No. 2. Oct. 29, 1909. Feet.	No. 3. Dec. 21, 1909. Feet.	No. 4. Feet.
Salt sand	.....	.....	550- 820	.....
Limestone	.....	1,060-1,100	1,036-1,106	1,060-1,100
Red rock	.....	1,120-1,125	none	.....
Oil sand	1,157-1,169 (gas)	1,135-1,144	1,138-1,170	1,137-1,170
Brown sand	.....	1,144-1,165	.....	.....
Lighter sand	.....	1,165-1,170	.....	.....
Black shale	1,169-1,172	1,175-1,178	1,170-1,198	.....
Total	1,172	1,178	1,198	1,176
Fresh water	.....	70	50 and 80	.....
Conductor	.....	.....	14	.....
Casing—				
10-inch	.....	80	84	81
8¼-inch	555	430	350	372
6¼-inch	1,072	1,072	1,062	1,072

No. 1 is a gas well.

On the J. S. Clifford heirs' lease, west half of northwest quarter of Section 23, there are two producing wells. The record of No. 1, drilled January 4, 1910, is as follows:

	Feet.
Limestone	1,127-1,162
Oil sand	1,192-1,242
Total depth	1,242
Casing—	
10 -in.	56
8¼-in.	400
6¼-in.	1,130

On the Sarah E. Cooper farm, northwest quarter of Section 23, there is one well with the following record:

Record of Well on Sarah E. Cooper Lease.

(Date completed, March 9, 1910.)

	Feet.
Salt sand	615– 810
Limestone	1,095–1,130
Shale	1,130–1,143
Red rock	1,143–1,148
Shale	1,148–1,160
Oil sand	1,160–1,210
First pay	1,162
Fresh water	63
Conductor	13
Casing—	
10 -in.	40
8¼-in.	473
6¼-in.	1,105

On what is known as the Spindle-top church-lot lease, Twitchell & McFadden put down three wells, two in the southwest of Patoka Township and the other in the northwest quarter of the above section. No. 1 and No. 2 started in as gushers for this field and caused much of the activity in the north part of the field. No. 1 started at 200 barrels and No. 2 at 500 barrels. In No. 1 they got the sand at 1,182 feet and a shale break from 1,190 to 1,195 feet, then sand again from 1,195 to 1,236 feet. No. 3 was a light producer, starting in at 30 barrels. All three were producing only 30 barrels daily in November, 1910:

On the W. J. Rodgers lease, northeast of northeast of the section, there are two producing wells. The record of No. 1 is as follows:

Casing—	Feet.
10 -in.	20
8¼-in.	420
6¼-in.	1,120
Salt sand at	275
Limestone at	1,015
Red rock at	1,110
Oil sand at	1,192
First pay	1,200–1,227
Shot	120 qts.

On the J. Cooper nine acres, northeast quarter of the northeast of Section 23, Monroe Township, there is one producing well and one abandoned well that had a showing of oil. The record of the two shows:

Date Completed—	No. 1. Aug. 17, 1909. Feet.	No. 2. Oct. 11, 1909. Feet.
Salt sand	550–1,075	.....
Lime	1,075–1,120	.....
Red rock	1,150–1,165	.....
Oil sand	1,165–1,195	1,156–1,160 (Showing of oil)
Shaly break	.....	1,160–1,170
Gray sand	.....	1,170–1,175
Black slate	.....	1,175–1,198
Total	1,195	1,198
Casing—		
10-inch	60	13
8¼-inch	485	410
6¼-inch	1,092	1,080
Shot	120 qts.	Dry and plugged.

The initial production of No. 1 was 178 barrels, and it is now doing 18 barrels daily.

In the southeast of the northeast of Section 23, and in the west half of the northwest quarter of Section 24 is the M. Skinner lease, on which the second producing well in the field was drilled. There are now seven producing wells and one gas well on the lease, altogether making 50 barrels daily. The records of Nos. 1, 2 and 3 are as follows:

Record of Wells on M. Skinner Lease.

	No. 1. Feet.	No. 2. Feet.	No. 3. Feet.
Drive pipe, 12½-inch	57	73	98
Casing—			
10-inch	320	.....	.....
8¼-inch	785	510	490
6¼-inch	1,055	1,057	1,080
Depth to top of sand	1,146	1,137	1,161
Depth to pay sand	1,154	1,149	1,173
Total depth	1,196	1,206	1,207
Production first 24 hours (bbls.)	33	75	35
Number quarts nitroglycerin used in shooting	40	60	100

Bore No. 3 showed quite a quantity of gas, the rock pressure being about 150 pounds, and has since been used as a gas well.

Section 24, Monroe Township (T. 2 S., R. 8 W.).

In the north half of this section, on the Peoples' State Bank lease, there are two wells producing 5 barrels daily.

A dry hole was put down on the Williams lease, southeast of northwest of the section, with the following record:

	Thickness, Feet.	Depth, Feet.
Yellow clay	20	20
Gravel	10	30
Blue shale	30	60
Water sand	45	105
Shale	5	110
Limestone	10	120
Shale	10	130
Coal	5	135
Limestone	3	138
Shale	110	248
Limestone	15	263
Shale	230	493
Limestone	7	500
Shale	175	675
Salt sand	240	875
Shale	55	930
Salt sand	75	1,005
Limestone	15	1,020
Sand	30	1,050
Shale	25	1,075
Red rock	5	1,080
Limestone	30	1,110
Shale	20	1,140
Red rock	4	1,144
Shale	44	1,188
Broken sand and slate	42	1,230
Salt sand	..	1,235

A dry hole was also sunk on the James Farmer lease, northeast of southeast of the section, to a depth of 1,265 feet. The sand was found at 1,245 feet. The drill went into salt sand and the hole filled with water.

Section 15, Patoka Township (T. 2 S., R. 8 W.).

In the northwest quarter of this section Murphy & Co. put down their first drill in November, 1907. The result was a practically dry hole, with a very small showing of oil.

Record of C. Houchen's well No. 1, Pike County, Indiana.

(Commenced July 26, 1907; finished November 15, 1907.)

Western Engineering & Contracting Co., Fort Wayne, Ind., contractors.

Casing—	Feet.
12½-in.	25
10 -in.	833
8¼-in.	1,130
6¼-in.	1,422

Formations.	Top.	No. Feet.	Bottom.
Clay, etc	0	25	25
Sand	25	15	40
Coal	40	5	45
Sand	45	55	100
Slate	100	60	160
Coal	160	5	165
Slate	165	35	200
Lime	200	22	222
Sand	222	25	247
Slate	247	40	287
Lime	287	10	297
Slate	297	68	365
Sand	365	79	444
Shale	444	44	488
Coal	488	6	494
Shale	494	6	500
Sand	500	135	635
Shale	635	18	653
Sand	653	181	834
Shale	834	36	870
Sand	870	185	1,055
Lime	1,055	10	1,065
Slate	1,065	3	1,068
Lime	1,068	4	1,072
Slate	1,072	5	1,077
Lime	1,077	3	1,080
Slate	1,080	4	1,084
Lime	1,084	6	1,090
Slate	1,090	5	1,095
Sand	1,095	35	1,130
Slate	1,130	30	1,161
Sand	1,161	1	1,162
Lime	1,162	23	1,185
Slate	1,185	5	1,190
Lime	1,190	5	1,195
Shale	1,195	65	1,260
Lime	1,260	5	1,265
Shale	1,265	10	1,275
Salt sand	1,275	12	1,287
Salt sand	1,287	19	1,306
Shale	1,306	8	1,314
Shale	1,314	16	1,330
Sand	1,330	77	1,407
Lime	1,407	15	1,422
Lime	1,422	22	*1,444

*Total depth.

On the Perigo lease, northeast quarter of the southeast quarter of the section, three extremely light producing wells were put down and later abandoned.

In the northeast of the northeast of the section, on the S. E. Houchens farm, three producing wells have been drilled, with the following record for Nos. 1 and 2:

Date Completed—	No. 1. Oct. 15, 1910. Feet.	No. 2. Nov. 11, 1910. Feet.
Lime	1,140–1,154	1,109–1,117
Red rock	.....	.....
Top of oil sand	1,180	1,168
Brown oil sand	1,183–1,193	1,172–1,188
Hard watery sand	1,193–1,196	.....
Shale break	1,205–1,209	1,188–1,192
Black oily sand	1,209–1,217	.....
Black shale	1,217–1,220	.....
Initial production	75 bbls.	75 bbls.
Conductor	12 ft.	.....
Casing—		
10-inch	157 ft.	.....
8¼-inch	560 ft.	.....
6¼-inch	1,142 ft.	.....
Shot	.....	60 qts.

Section 14, Patoka Township (T. 2 S., R. 8 W.).

On the southwest quarter of the southwest quarter of the section on the Hoover farm there are three producing wells, with the following record for two of them:

	No. 1. Feet.	No. 2. Feet.
Casing—		
10-inch	18	36
8¼-inch	420	435
6¼-inch	1,123	1,124
Shot	180 qts.	160 qts.
Lime	.....	1,122–1,157
First sand, brown	1,180–1,193	1,190–1,200
Second sand, fine gray, oil bearing	1,217–1,226	1,210–1,228
Total	1,226	1,228

No. 2 had a five-foot break from 1,200 to 1,205, and from 1,205 to 1,210 was a mixture of sand and shale.

On the J. D. Grimes lease, immediately to the north of the above, in the southwest quarter of the section, there are three wells producing 130 barrels. The following are the records for Nos. 1 and 2:

Date Completed—	No. 1. Mar. 22, 1910. Feet.	No. 2. May 3, 1910. Feet.
Lime	1,096–1,145	1,098–1,133
Oil sand	1,195–1,204	1,162–1,190
Total	1,204	1,190
Conductor	14	.....
Casing—		
10-inch	68	85
8¼-inch	550	400
6¼-inch	1,098	1,098

There are nine producing wells on the W. Kays lease in the east half of the southwest quarter of Section 14. In the summer of 1910 seven of these wells were producing 140 barrels daily.

On the Mary E. Coleman lease, in the northwest of southwest, and in the southeast quarter of the northwest quarter of the section, there are also nine producing wells which, in November, were yielding 130 barrels daily. The record for five of these is as follows:

Date Completed—	No. 1. Apr. 26, 1910. Feet.	No. 2. May 19, 1910. Feet.	No. 3. June 14, 1910. Feet.	No. 4. May 31, 1910. Feet.	No. 5. June 27, 1910. Feet.
Salt sand	585– 610	.....	585– 605	.....	.....
Limestone	1,090–1,142	1,090–1,130	1,089–1,131	1,115–1,150	1,102–1,132
Oil sand	1,174–1,200	1,155–1,188	1,152–1,208	1,185–1,218	1,170–1,221
Total	1,200	1,188	1,208	1,218	1,221
Fresh water	.....	.....	60	.....	70
Casing—					
10-inch	18	20	30	90	.....
8¼-inch	318	330	360	420	.....
6¼-inch	1,090	1,090	1,089	1,119	.....
Conductor	.....	.....	.....	14	.....

On the J. Nixon farm, in the west half of the southeast quarter of Section 14, the Nixon Oil Company drilled in their famous gas well which supplies Oakland City with gas for fuel. Later, pro-

ducing oil wells were also completed. No. 4, however, proved practically a dry hole, but made enough gas to warrant its being made into a gas well. The two producing wells are making five barrels daily. The drilling record of the lease follows:

Record of Wells on the Nixon Lease.

	No. 1. Feet.	No. 2. Feet.	No. 3. Feet.	No. 4. Feet.
Casing—				
10-inch	30	40	32	125
8¼-inch	380	454	440	440
6¼-inch	1,120	1,092	1,100	1,105
Top of sand	1,192	1,165	1,166	1,177
Gas sand to	1,103	1,175	1,181	1,193
Shale break to	1,107	1,183	1,186	.....
Oil sand to	.....	1,209	1,215	1,271
Total	1,107	1,211	1,220	1,286
Shot	.....	140 qts.	.....	Dry

In the northwest quarter of the southeast quarter of the section, on the J. Kays lease, there is a gas well.

On the southwest quarter of the northwest quarter of the section, on the Fred Wiggs lease, there are five producing wells and one drilling well. These wells are producing from 95 to 100 barrels daily. The record for four of these wells is as follows:

Record of Wells on the Fred Wiggs Lease.

	No. 2. Feet.	No. 3. Feet.	No. 4. Feet.	No. 5. Feet.
Lime	1,100–1,140	1,110–1,140	.....	1,101–1,138
Sand	1,167–1,170	1,174–1,217	1,157–1,212	1,163–1,224
Total	1,200	1,217	1,212	1,224
Casing—				
10-inch	84	76	72	110
8¼-inch	460	445	400	410
6¼-inch	1,106	1,110	1,107	1,101
Initial production	260 bbls.	100 bbls.	.....	.....

On the D. C. Barrett lease, in the southwest of the northeast of the section, there is also one producing well making ten barrels daily.

The Primo Oil Company, a local company, operates six wells on the J. P. Harkness lease, Patoka Township, northwest of northwest of Section 14. They have the following records:

Date Finished—	No. 1. May 11, 1910. Feet.	No. 2. June 11, 1910. Feet.	No. 3. June 30, 1910. Feet.	No. 4. Aug. 5, 1910. Feet.	No. 5. Sept. 24, 1910. Feet.	No. 6. Oct. 7, 1910. Feet.
Conductor	13	.....	.....	.....	.....	.....
Casing—						
10-inch	90	80	88	88	160	128
8¼-inch	424	420	410	395	460	.....
6¼-inch	1,105	1,089	1,122	1,100	1,114	1,129
Shot	200 qts.	240 qts.	140 qts.	180 qts.	.....	170 qts.
Lime	1,100–1,135	1,087–1,117	1,120–1,150	1,097–1,125	1,114–1,101	1,127–1,162
First sand	1,161–1,201	1,156–1,207	1,190–1,205	1,151–1,198	1,180–1,193	1,195–1,208
Gas	.....	1,196–1,200	.....	.....	.....	.....
Shaly break	.....	.....	1,205–1,211	.....	1,193–1,199	1,193–1,199
Second sand	.....	.....	1,211–1,231	.....	1,199–1,230	1,213–1,285
Total	1,201	1,207	1,231	1,198	1,230	1,240

In No. 6, a gas break was reported below the second sand from 1,234 to 1,240 feet. This lease, in November, 1910, was producing 100 barrels daily.

The Primo Oil Company also operates three wells on the F. Bruce lease, in the northeast of the northwest of the section, their records being as follows:

Date Completed—	N. 1. June 9, 1910. Feet.	No. 2. July 11, 1910. Feet.	No. 3. Sept. 24, 1910. Feet
Conductor	.....	12	8
Casing—			
10-inch	80	76	106
8¼-inch	435	130	415
6¼-inch	1,102	1,110	1,118
Shot	200 qts.	160 qts.	.....
Lime	1,100–1,137	1,107–1,147	1,119–1,149
First sand	1,159–1,205	1,172–1,188	1,178–1,235
Shaly break	.....	1,188–1,193	.....
Second sand	.....	1,193–1,210	.....
Total	1,205	1,210	1,235
First 24 hours production	175 bbls.		

The Crude Oil Company, also a local company, is operating three wells on the Kern lease, northeast of northwest of Section 14, Patoka Township. The record of No. 3 on this lease is as follows:

Casing—	Feet.
10 -in.	130
8¼-in.	440
6¼-in.	1,128
Brown sand	1,188–1,206
Slaty break	1,206–1,211
White sand	1,211–1,236
Total	1,238

This well was a small producer, and gas was found in the first screw of brown sand, both gas and oil in the white and.

No. 1, on this lease, having about the same casing record but 20 feet shallower, had an initial output of more than 100 barrels a day, and in November was producing 15 barrels.

On the C. D. Houchens lease, in the northeast of the northwest of the section, there are also two producing wells.

On the H. P. Beatty farm, east half of the northeast quarter of the section, a gas well was drilled November 13, 1910. This well was drilled soon after the well on the Brown farm, northwest quarter of Section 13, which had reopened a portion of the field already abandoned, by drilling into a deeper sand. The Beatty well came in a roaring gas well and was quite a surprise, as the location is only 400 feet from the Brown well. The capacity of the well when first drilled was estimated at 12,000,000 feet. The pressure was so great that it drilled itself into salt sand and the pressure became smaller because of the gas being drowned out by salt water. On November 19 the well was gauged and showed 475 pounds' rock pressure and the daily capacity being then estimated at 2,500,000 cubic feet. The following is the pipe and sand record for the Beatty well:

Casing—	Feet.
10 -in.	146
8 -in.	400
6¼-in.	1,107
Oakland City sand	1,176–1,183
Broken formation	1,183–1,218
Limestone at	1,218
Second sand	1,232–1,243

Section 13, Patoka Township (T. 2 S., R. 8 W.).

The first bore put down in this section was on the Brown farm, in the southeast quarter of the northwest quarter in March, 1910. The result here was much the same as in the foregoing Beatty well. At a depth of 1,243 feet gas was struck and the capacity was judged to be from two and a half to three million feet at the time the drillers left on the night it was completed. The next morning when the well was visited there was no gas pressure and only a hole full of water remaining.

On October 7, 1910, another test was put down on the Brown farm, going to a depth of 1,236 feet. At 1,228 feet a second sand was struck, which is comparable to the Illinois Tracy sand. There was a quantity of gas giving off a strong sulphurous odor. The initial production was 150 barrels of oil, and for some time before it was put to pumping, it flowed 50 barrels daily. The drilling record of this well is as follows:

Casing—	Feet.
10 -in.	124
8¼-in.	420
6¼-in.	607
Oakland City sand (gas and oil)	1,171–1,185
Broken formation	1,185–1,218
Limestone	1,210–1,218
Shale	1,218–1,228
Second sand	1,228–1,236

Immediately to the south of the Brown lease, in the southwest of the northwest of Section 13, there is a six-acre plot, the lease of which brought $600.00 bonus a few days after the drilling of the Brown well. On November 12 a very light producing oil well was drilled on this lease about 400 feet distant from the Brown well.

Section 12, Patoka Township (T. 2 S., R. 8 W.).

Following the drilling of the Brown well a dry hole was put down on the Johnson farm, southeast quarter of the southeast quarter of Section 12, going to a depth of 1,235 feet.

Section 18, Patoka Township (T. 2 S., R. 7 W.).

The three bores put down in this section are dry holes, both mentioned in the early history of the field. These wells are on the T. H. Wood farm, west half of the northwest quarter of the section.

Section 7, Patoka Township (T. 2 S., R. 7 W.).

There is but one well in this section, that being the first drilled of the Pioneer wells before mentioned.

Section 9, Patoka Township (T. 2 S., R. 8 W.).

The only endeavor in this section was near the Klondike Mine on the Eliza Martin farm, southwest quarter of the section. The result was a dry hole.

Section 10, Patoka Township (T. 2 S., R. 8 E.).

On the Eliza Martin farm of 180 acres, in the northwest quarter of the section, a dry hole was drilled, with the following detailed strata record:

Record of Dry Hole on the Eliza Martin Farm.

(Date completed, October 29, 1909.)

Strata.	Thickness, Feet.	Depth, Feet.
Soil	25	25
Limestone	3	28
Sandstone	7	35
Limestone	65	100
Black shale	32	132
Sandstone	43	175
Limestone	25	190
Muddy slate	15	205
Limestone	5	210
Muddy slate	20	230
Sandstone (water)	15	245
Black slate	10	255
White slate	95	350
Salt sand (water)	15	365
Shale	5	370
Limestone	10	380
Muddy slate	15	395
Slate	15	410
White sand	50	460
Limestone	15	475
White slate	25	500
Sandy limestone	50	550
Slate and sand	50	600
Salt sand	120	720
Muddy slate	60	780
Limestone	15	795
Sand and shale	105	900
Black shale	40	940
Limestone	15	955
Lime shells	45	1,000
Muddy slate	40	1,040
Salt sand	40	1,080
Shale	10	1,090

	Thickness, Feet.	Depth, Feet.
Limestone	10	1,100
Shale	5	1,105
Salt sand	25	1,130
Limestone	30	1,160
White slate	20	1,180
Limestone	15	1,195
Slate	5	1,200
Shale	30	1,230
Sand	15	1,245
Shale	10	1,255
Sand	5	1,260
Salt sand	15	1,275
Sand	15	1,290
Shale	10	1,300
Brown sand	15	1,315
Brown shale	10	1,325
Sand blue lick water	28	1,353

On the Cochran farm, southeast quarter of the southeast quarter of Section 10, there are three wells doing 50 barrels daily, the record being as follows:

	No. 1, Feet.	No. 2, Feet.	No. 3, Feet.
Conductor	12	12	12
Casing—			
10 -in.	..	128	123
8¼-in.	500	485	495
6⅝-in.	1,148	1,120	1,138
Top of sand	1,207	1,176	1,200
Total depth	1,259	1,218	1,238

Initial production, 90 lbs.

On the J. G. Grimes lease, northeast of the southeast of the section, two dry holes were drilled, with the following record:

	No. 1, Feet.	No. 2, Feet.
Conductor	12	13
Casing—		
10 -in.	160	150
8 -in.	500	490
6¼-in.	1,143	1,150
Top sand	1,205	1,226
Total depth	1,239	1,244

These wells were drilled into salt water and they filled to the top.

Section 11, Patoka Township (T. 2 S., R. 8 W.).

The Swastika Oil Company, composed wholly of Oakland City business men, is operating a lease on the A. Hurt farm on the southwest quarter of Section 11 and the southeast quarter of Section 10. This company has 11 wells, with the following records:

Date—	No. 1. Jan. 3, 1910. Feet.	No. 2. Apr. 15, 1910. Feet.	No. 3. June 10, 1910. Feet.	No. 4. July 24, 1910. Feet.	No. 5. Aug. 5, 1910. Feet.	No. 6. Aug. 4, 1910. Feet.
Casing—						
10-inch	130	32	20	120	160	160
8¼-inch	480	460	440	450	.....	.....
6¼-inch	1,128	1,138	1,132	1,140	1,135	1,124
Shot	140 qts.	160 qts.	180 qts.	180 qts.	220 qts.	225 qts.
Sand at	1,185	1,199	1,196	1,199	1,194	1,182
Thickness of sand	47	49	43	52	52	40
Break	6	4	4	4	.....	.....
Total	1,232	1,248	1,245	1,251	1,246	1,222

Date—	No. 7. Aug. 26, 1910. Feet.	No. 8. Oct. 6, 1910. Feet.	No. 9. Sept. 13, 1910. Feet.	No. 10. Oct. 12, 1910. Feet.	No. 11. Oct. 12, 1910. Feet.
Casing—					
10-inch	165	.....	.....	.....	160
8¼-inch	.....	450	460	460	.....
6¼-inch	1,133	1,135	1,123	1,117	1,124
Shot	.....	220 qts.	120 qts.	120 qts.	100 qts.
Sand at	1,199	1,203	1,185	1,188	1,179
Thickness of sand	49	54	46	42	37
Pay at	.....	.....	1,214	.....	1,199
Total	1,244	1,257	1,231	1,230	1,219

No. 9 was drilled into salt water.

This lease was one of the most rapidly developed in the field, and is well equipped with a large Mascot belted power and a Bessemer gas engine pumping seven of the wells. This power can accommodate 25 wells and will, in time, be used to pump 15 or more. After No. 9 was completed the lease was reported to be making 180 barrels daily.

In the southwest corner of the southwest quarter of the section there is a small lease with two producing wells.

On the Whitman lease, in the northwest of the southwest of the section there are two wells making 18 barrels.

On the Thurman lease, northwest of the southwest of the section, there are two producing wells, the record of No. 2 being as follows:

(Completed, September 10, 1910.)

Casing—	Feet.
10 -in.	200
8¼-in.	480
6⅝-in.	1,128
Sand	1,193
Oil	1,209
Total depth	1,227
Initial production	124 bbls.
Shot	100 qts.

On the Craig lease to the east of the Thurman and Whitman leases there are four producing wells, with the following record for Nos. 3 and 4:

Casing—	No. 3. Feet.	No. 4. Feet.
10 -in.	26	123
8¼-in.	444	435
6¼-in.	1,132	1,109
Sand	1,177–1,231	1,120–1,223
Total	1,231	1,223

This lease, in November, was producing 40 barrels daily.

The Ohio Oil Company drilled four wells on the George Murray lease, southwest quarter of Section 11, Patoka Township, with the following records:

	No. 1. Feet.	No. 2. Feet.	No. 3. Feet.	No. 4. Feet.
Casing—				
10-inch	21	60	21	60
8¼-inch	461	430	439	500
6¼-inch	1,141	1,110	1,143	1,130
Top of sand	1,195	1,163	1,200	.....
Gas	1,195	1,165	1,203	1,195
Oil	1,200	1,168	1,207	1,197
Best oil	1,205	1,172	1,215	1,200
Total	1,235	1,189	1,235	1,227
Shot	100 qts.	.....	80 qts.	60 qts.
Production first 24 hours	30 bbls.	20 bbls.	5 bbls.	.....
Production second 24 hours	.....	15 bbls.	.....	.....

On the E. J. Wiggs farm five wells have been drilled on the southwest quarter of the section and one on the southeast quarter. The latter, which was No. 1 on the lease, was practically a dry hole and was abandoned. No. 5 was also a dry hole. The other four wells are making 40 barrels daily. The record for No. 1 is as follows:

	Feet.
Conductor	11
Casing—	
10 -in.	425
8¼-in.	1,056
Sand	1,178–1,183
Sand and lime	1,225–1,235

On the E. J. Wiggs farm, southwest of the southeast of the section, there was one producing well.

On the Fred Wiggs five-acre lease, southwest of southeast, a good producing well with the following record:

	Feet.
Conductor	12
Casing—	
10 -in.	134
8 -in.	485
6¼-in.	1,121
Sand	1,160–1,177
Initial production	75 bbls.

On the Burchfield lease, southeast of the southeast of Section 11, a dry hole was drilled. Here but one sand was passed through and Blue Lick water was reached at 1,235 feet.

On the B. Keaton lease, southeast quarter of the northwest quarter of the section, three producers have been drilled, with the following record for two of them:

	No. 1,	No. 2,
Casing—	Feet.	Feet.
10 -in.	190	105
8¼-in.	435	530
6¼-in.	1,140	1,139
Sand	1,194–1,214	1,183–1,216
Total depth	1,235	1,216

On the Eliza Martin farm, in the southwest quarter of the northwest quarter of the section, five wells have been drilled, the records being as follows:

Date Completed—	No. 1. Feet.	No. 2. Sept. 12, 1910. Feet.	No. 3. Nov. 4, 1910. Feet.	No. 5. Nov. 10, 1910. Feet.
Lime	.....	1,106–1,140	1,086–1,110	1,083–1,123
Oil sand	1,163–1,185	1,161–1,179	1,167–1,194	1,139–1,192
Best oil	1,173–1,185	1,167–1,179	1,186–1,194	1,176–1,192
Break	.....	1,179–1,194	.....	.....
Brown lime	.....	.....	1,203–1,205	.....
Total	1,217	1,214	1,205	1,192
Casing—				
10-inch	145	160	160	125
10¼-inch	.....	.....	.....	20
8-inch	420	418	435	440
6¼-inch	1,107	1,109	1,086	1,083
Shot	220	.....	80 qts.	60 qts.
Conductor	69	8	.....	.....

On the Thurman lease, northwest quarter of the northeast quarter of the section, a dry hole was put down, with the following record:

Casing—	Feet.
10 -in.	85
8 -in.	535
6¼-in.	1,130
Sand	1,145–1,154
Total depth	1,228

On the northeast quarter of the northeast quarter of Section 11, one bore was put down, getting only a showing of oil. The result was practically a dry hole, with the following record:

Casing—	Feet.
10 -in.	85
8¼-in.	535
6¼-in.	1,109
Sand at	1,161
Total depth	*1,218

*Not all sand.

Section 2, Patoka Township (T. 2 S., R. 8 W.).

In this section but one bore was sunk. This was put on the E. Martin lease, southeast quarter of the southwest quarter of the section. The result was a dry hole.

GAS IN THE OAKLAND CITY FIELD.

Locations of the various gas wells are noted in the foregoing records, but the following will give an idea of the supply of gas in the field. As is generally known, one of the principal causes of the wholesale abandonment of the wells in the Trenton rock field of the State was a lack of fuel to furnish power to pump the small producing wells. The production in these wells having fallen off to such an extent and the gas supply having failed, it did not pay to buy fuel to pump them. Had the gas been husbanded, many of them could yet be pumped with profit. However, in the Oakland City field, the operators have realized the mistakes made in the old field and are willing to do what they can toward conserving the gas supply for the future. When the wells have paid out and have dwindled so that the output is but two or three barrels per well per day they will still be able to pump them with the fuel at hand, and the returns will be clear profit.

However, the State Supervisor seems to have had his troubles. Early in 1910 he made a visit to the field and found that wells which had been recently drilled in and not yet put to pumping were left open and the gas allowed to escape. He at once ordered them closed in and ordered that all gas producing wells should be closed in as soon as completed. The oil operators obeyed, but, finding that they were losing money because of the cutting or roiling of the oil, making it frothy so that the pipe lines refused to take it off their hands, they again opened up their wells and prepared to stand trial and bring the gas laws to a test. Several of the operators were arrested and their cases were brought before a justice of the peace. Here the cases were thrown out because, in a mysterious way, the last legislature had repealed the penalty clause of the law pertaining to gas waste. Later an injunction suit to prevent waste of gas was filed in the Circuit Court at Petersburg. Here, again, the State was defeated and the injunction refused. In the history of the Oakland City field, however, there has been but little wanton waste of gas, and from conversation with various operators, it is my opinion that they desire to conserve the gas. They realize its value and are looking toward the future. However, some people interested in gas production claim that the pressure has been weakened by wells being left open before being put to pumping.

In almost every lease enough casing head gas is produced to furnish fuel for pumping the wells on the lease. Many have enough

gas for both drilling and pumping power. Those who do not, buy gas from other producers who have large producing gas wells.

The well on the Nixon lease furnishes gas for fuel in Oakland City. The company which operates this well is getting 20 cents per thousand cubic feet for the gas, and has so far sold twenty-eight million cubic feet from the one well. This well, it might be noted. was drilled only eight feet in the sand and has never been shot.

The M. Burnett well is furnishing gas for field purposes to the Murphy Oil Company and, in addition, feeds boilers for powers and drilling wells. The well on the Sim Burnett farm is standing idle, and the owners are said to be trying to sell their gas to the Oakland City company, or to a firm which has received a franchise for selling gas in the town of Winslow. This firm is now installing its plant and laying lines to the field.

The Ohio Oil Company is using gas from the well of the Johnson (Grim) farm for field purposes.

The gas well on the Bertha Williams farm is closed in.

The well on the J. Kays farm is furnishing gas to the Shoup Oil Company leases. Other gas wells are either shut in or furnishing to the drilling wells or pumping powers.

A test at one of the wells in the field was made of a recently patented device for making gasoline out of the casing-head gas. The result was unsuccessful, as only one pint of gasoline was taken from 1,000 cubic feet of gas under the most favorable circumstances. This device is being used successfully in other fields.

The Life of Wells.—The drop-off in production of oil in wells in the Oakland City field is very pronounced. Wells in the mile-wide territory that comprises the main producing territory of the field have an initial output of from 100 to 200 barrels and even as high as 285 barrels daily. These wells, as a general thing, drop off in production in about 30 days to 40 or 50 barrels daily, and from that gradually dwindle to 10 barrels in about a year's time and hold pretty well at that point.

The Cost of Producing Wells. In talking to two of the leading operators in the field, they were asked what was the approximate cost of a producing well put to pumping. One who had put down nine wells replied that they had cost him between $3,200 and $3,500 apiece, and that this cost was too great for him to make any money.

The other operator questioned, who had drilled 30 wells in and around the field, replied that his wells had cost him $3,700 each.

The following are the standard prices for supplies necessary to put a well to pumping, quoted at one of the supply stores at Oakland City:

Casing—	
10 -in. (second hand), per foot	$0 95
8¼-in. (second hand), per foot	62
6¼-in. (new iron) per 100 feet	42 75
6¼-in. (new steel), per 100 feet	40 70
5 -in. (iron), per 100 feet	33 00
Tubing, 2-in., per 100 feet	12 00
Rods, per 100 feet	4 03
Line pipe, 2-in. (iron), per 100 feet	11 75
Line pipe, 2-in. (steel), per 100 feet	8 85
Wooden conductor, per feet	50
Pull rods, per 100 feet	5 00
Pumping outfit	14 00
Casing head	2 38
Pumping jack	15 50
Two tanks and tank house	250 00
25 H. P. engine, Twentieth Century power, cement foundation and floor, wooden power house (Accommodating 25 wells, ready to start.)	1,675 00
15 H. P. engine, small power accommodating 8 wells, cement foundations and floor, ready to start	925 00

The three supply companies having stores at Oakland City are the "Oil Well Supply Co.," the "Illinois National Supply Co," and the "Jarecki Supply Co." There is also a machine shop for the repairing of drillers' implements.

COST OF DRILLING AND PRICE OF LABOR.

The standard price paid for drilling in the Oakland City field is one dollar per foot. A greater price, of course, was paid when wildcatting was first being done in the field. The average time taken to complete a well is twenty days, barring all accidents.

After the drilling in and shooting of a well, the contractor gets $20 a day for cleaning out until the well is put to pumping.

Labor has been plentiful in Oakland City, as many drillers and other help have come there from other fields. The prices paid for labor are as follows:

Drillers, per day	$5 00
Tool dressers, per day	4 00
Pumpers, per month	71 00
Teamsters, including team, on lease, per day	4 00
Teamsters, for contractors, per day	5 00

THE SHOOTING OF WELLS.

Much trouble has been experienced in the shooting of wells in the Oakland City field. At first large shots (100 to 200 quarts of nitroglycerine) were deemed necessary to make the proper crevice in which the oil was to flow. In shooting with the large shots the casing had to be pulled out beforehand, as the bottom of the 6¼-inch casing was too close to the shooting point and, there not being enough water to hold the shot down, the casing would collapse if left in. The pulling of the casing takes about six hours, and the replacing another six hours. Later, however, the larger operators tried the experiment of shooting with a small shot with the casing left in, and then shooting again if the cavity made was not large enough. Sixty quarts is the largest shot that should be used if the casing is left in. When the shooting is done with the casing in the bore, the shot is set off by the dropping of a "jack squib," but when the casing is pulled the shot is fired by means of an electrical battery.

The companies having shooters in the Oakland City field are the DuPont Powder Co. and the Illinois Torpedo Co. They have magazines in out-of-the-way places in the country around Oakland City. The standard price for shooting is one dollar a quart.

The oil men of Oakland City are very well pleased with the new well-plugging law, and when a dry hole has been drilled in, plug it as soon as possible. They claim that one improperly plugged hole will ruin all the producing wells in the vicinity, especially where the hole is filled with salt water. A list of the plugged wells or dry holes in the Oakland City field from October, 1909, to December 1, 1910, is as follows:

Number of Well.	Farm.	Township.	Section.
2	Jno. Cooper	Monroe	23
1	Lemon	Monroe	6
1	E. Martin	Patoka	10
1	P. Mason	Monroe	27
1	M. Thompson	Monroe	13
1	Jos. McKinney	Monroe	35
1	Edgar Grubb	Monroe	2
1	Ashby	Monroe	35
1	E. Connor	Monroe	35
5	J. B. Cato	Monroe	28
1	C. D. Houchens	Monroe	22
1	N. Williams	Monroe	24
1-2-3	W. Perigo	Patoka	15
4	W. D. Mason	Monroe	26
5	J. B. Cato	Monroe	27
3	Jno. Clifford	Monroe	23
1	W. W. Shy	Monroe	22
3	Bertha Williams	Monroe	22
3-4	Oliver Mason	Monroe	22
4	A. Skinner	Monroe	22
5	Henry Wiggs	Patoka	11
1	John Kays	Monroe	27
1	H. Yager	Monroe	26
1-2	J. D. Grimes	Patoka	10
1	G. Cato	Monroe	19
5	G. B. Grimm	Monroe	23
1	T. J. English	Monroe	27

Those wells plugged outside the Oakland City field, but in the southwestern portion of the State, are as follows:

Owner of Farm.	County.	Township.	Section.	Drilled by
Maurice Spaulding	Daviess	Bar	36	J. B. Graham.
Wm. Rausch	Dubois	Patoka	33	Wm. Rausch.
Geo. W. Kendall	Dubois		35	F. W. Whitmire.
Commodore Dixon	Dubois	Jefferson	24	Alex. McDonald.
Geo. Kirner	Dubois	Patoka	35	Clark Crowe.
A. J. Bottles	Harrison	Scott	23	C. W. Veitch.
W. M. Jones	Knox	Harrison	9	R. G. Griffin.
P. Arvin	Martin	Perry	35	J. B. Graham.
Eliza Martin	Pike	Washington	7	W. McLaughlin.
Sarah Hornady	Pike	Washington	28	W. F. Lory.
P. Willis	Pike	Madison	5	Ohio Oil Co.
W. H. Smith	Pike	Logan	20	J. A. Crawford.
Fred Frakes (1 and 2)	Spencer	Jackson	2	Southern Oil & Gas Co.
W. Williams	Spencer	Jackson	2	Southern Oil & Gas Co.
Gray Bullock	Spencer		2	J. M. Hatfield.
S. E. Kercheval	Spencer	Clay	18	Smith Neely Oil Co.
John Hill	Spencer		6	J. M. Hatfield.
Lee McGlothlin	Warrick	Lane	28	M. Murphy Oil Co.
J. B. Thompson	Warrick	Owen	21	W. J. Rodgers.
Jno. A. Miller	Warrick	Hart	36	Ohio Oil Co.

The above comprise most of the wildcat wells drilled in the southwestern portion of the State. Some of the drilling records of these wells will be found below.

A record of the well on the A. J. Bottles farm, Section 23, Scott Township, Harrison County, was furnished by Mr. Arthur Pratt, contractor. It is as follows:

	Thickness, Feet.	Depth, Feet.
Clay	35	..
Gravel	12	47
Hard white lime	35	82
Cavy mud and boulders	14	96
White limestone	190	286
Brown limestone	60	246
White limestone	15	361
Brown limestone	40	401
Limestone shells	20	421
Hard white sand	50	471
Soft limestone	10	481
Hard white sand	50	531
Dark limestone	10	541
Shale	50	591
Black shale	110	701
White sand	15	716
Gray sand	10	726
White sand	20	746
Dark lime	260	1,006
Shale	49	1,055
Lime	35	1,090
Shale	50	1,140
Sandy lime	35	1,175
Salt water sand	25	1,200
Salt water sand	40	*1,240

*Total depth.

Water was found as follows:

	Feet.
Sulphur water at	390
Great amount of water at	410
Small amount of water at	850
Salt water at	1,220

The record of the bore on the Wm. Rausch farm, Section 33, Patoka Township, Dubois County, is as follows:

At 415 feet, 10 feet of sand.
At 815 feet, 15 feet of sand, a little gas.
At 1,006 feet, 12 feet of sand, showing of oil.
1,006–1,091 feet, slate.
1,091–1,150 feet, limestone.
Total feet 1,150.

Casing—	Feet.
10 -in.	80
8¼-in.	520
6¼-in.	976

A record of the well drilled by the Ohio Oil Company on the John A. Miller farm, Section 36, Hart Township, Warrick County, is as follows:

Casing—	Feet.
10 -in.	60
8¼-in.	815
6¼-in.	1,093
Top of sand	1,131
Total depth	1,427

The record of the well drilled on the P. Willis farm, northwest quarter of Section 5, Madison Township, Pike County, is as follows:

Casing—	Feet.
10 -in.	89
8¼-in.	700
6¼-in.	1,100
Salty sand	1,319
Total	1,324

The record of the well on the Sarah Hornaday farm, Section 28, Washington Township, Pike County, is as follows:

Casing—	Feet.
10-in.	120
8¼-in.	454
6¼-in.	973
Sand	*1,005–1,035
Total	1,200

*Showing of oil.

PRODUCTION IN THE OAKLAND CITY FIELD.

Two companies, the Pure Oil Company of Pittsburg and the Ohio Oil Company, are buying the crude oil from the Oakland City field. In June, 1909, the Pure Oil Company commenced taking the production. Their oil is pumped into five 27,500-barrel tanks at Muren Station and is loaded by means of a 12-car loading rack and shipped from this point.

In November, 1910, the Ohio Oil Company completed a six-inch branch pipe line from Bridgeport, Illinois, to the Oakland City field. This line connects with a line from Bridgeport to the Mar-

tinsville, Illinois, tank farm. This Oakland City pipe line enters the field through sections 21 and 22. Both the Ohio and the Pure Oil companies have three- or four-inch lines laid along all the main roads throughout the field. From these, two-inch laterals are run to tank houses on the leases. Small "donkey pumps,, are used to force the oil through the lines.

The total well runs for the Oakland City field from June 5, 1909, until December 1, 1910, by both companies, was 591,780.3 barrels.

The price of the Oakland City oil has remained at 60 cents for some months.

CHEMICAL PROPERTIES OF OAKLAND CITY OIL.

The crude oil from the Oakland City field is a dark, thick liquid with a disagreeable odor and a mixture of paraffine and asphalt base. A sample of the oil from a well in the middle of the field was sent to T. W. Smith, analytical chemist. The results of his tests are, for comparison, placed by the side of those of a sample of Trenton rock oil from Van Buren, Indiana, and are as follows:

	Oakland City.				Van Buren.			
	Per Cent.	Specific Gravity.	Degrees Beaume.	Flashing Point.	Per Cent.	Specific Gravity.	Degrees Beaume.	Flashing Point.
Original Oil.....	.....	0.847	36°	.....	.....	0.853	35°	.....
Below 150°C.....	10.5	0.734	62°	Below 20°C.	7.2	0.719	.....	Below 20°C.
150°-200°C.....	12	0.756	57°	Below 20°C.	10.2	0.759	56°	Below 20°C.
200°-250°C.....	11	0.790	47°	Below 38°C.	10.2	0.799	47°	60°C.
250°-300°C.....	9.5	0.810	44°	Below 81°C.	12.2	0.826	41°	82°C.
300°-350°C.....	10.5	0.846	36°	Below 122°C.	14.8	0.844	37°	96°C.
350°-400°C.....	10	0.860	34°	Below 123°C.	41.8	0.860	34°	38°C.
Total distillate to 400°C.....	63.5	.....	.....	.....	96.4	.....	.....	.....

From the table it will be seen that the Oakland City oil yielded 10.5 per cent. naphtha below 150 degrees C. and 25 per cent. kerosene up to 275 degrees C., while the Trenton rock oil yielded 10 per cent. naphtha and 33 per cent. kerosene below and up to the same temperatures. The total residue above 400 degrees C. amounted to 34.5 of the original oil. It had a specific gravity of .955, or 17 degrees Beaume, and is very suitable for a road oil for the surface of roads.

OIL AND COAL RIGHTS.

Since the Oakland City oil field is within the limits of the coal producing area of the State, the question of the rights of oil operators to drill through coal lands which are under lease or being mined by coal companies has several times arisen. It was specifically brought up in October, 1910, by David Ingle, president of the Ayrshire Coal Company, who, in a letter to the Director of the Indiana Department of Geology, asked the following questions:

I. Will you please advise us what the law is, or if no law, what the procedure is, in Indiana, with reference to drilling oil and gas wells through the coal seams and mines in Indiana.

II. Is there any law, or any reason why, if oil wells are properly cased and plugged, we should not remove the coal right up to and against the 10-inch casing of such a well?

III. Could you also advise us whether, when we have bought and had a deed properly recorded for the coal under a man's land, we could legally resist the attempt of an oil driller to drill through our coal, when he is drilling under an oil or gas lease given subsequent to our filing and recording of our purchase of the coal under the same property?

Since these questions involved legal points upon which the Director did not wish to pass, they were submitted to Hon. James Bingham, Attorney-General of Indiana, who, on October 14, rendered his decision as follows:

STATE OF INDIANA;
INDIANAPOLIS, IND., October 14, 1910.

Hon. W. S. Blatchley, State Geologist,
Indianapolis, Indiana:

DEAR SIR—I am in receipt of your letter of October 7th, enclosing letter from Mr. David Ingle, president of the Ayrshire Coal Company, in which you request my opinion as to whether the owner of all the coal under the surface of certain real estate can legally resist the attempt of an oil driller to drill through such coal in order to get the oil beneath it, in case where the oil driller is the owner of an oil or gas lease given subsequent to the conveyance of such coal by the owner of the surface. Also as to whether the owner of such coal is legally entitled to remove the coal up to and against the casing of such oil or gas well.

The owner of the fee in real estate owns all below the surface, and there may be separate and distinct estates in different persons in the surface of land, the coal under the land, and the right to take oil or gas through the coal owned by one person and the surface owned by another,

The owner of the fee may legally sell and convey the coal under his land to one person and give by contract the right to a third person to take the oil or gas from below the coal strata.

Coal under the surface in place is itself real estate, and title to it may be severed from title to the surface and pass to different persons.

Brand v. Consolidated Coal Co., 76 N. E. 849;
Kincaid et al. v. McGowan et al. (Ky.), 13 L. R. A. 289;
Peterson v. Hall, 50 S. E. 603;
Lillibridge v. Coal Company, 143 Pa. 293.

While the grantee of the coal under the surface owns such coal he owns nothing else, save the right to access to it and the right to remove it. His rights in the real estate terminate upon the removal of the coal. As said in the case of Chartiers Block Coal Co. v. Mellon, 152 Pa. St. 286, at page 297:

> "When the coal is all removed the estate ends for the plain reason that the subject of it has been carried away. The space it occupied reverts to the grantor by operation of law. It needs no reservation in the deed because it was never granted."

It was further said in this case, that,

> "The owner of the coal must so enjoy his own rights as not to interfere with the lawful exercise of the rights of others who may own the estate, either above or below him. The right of the surface owner to reach his estate below the coal exists at all times."

This being true, and the owner of the surface having the right to reach his estate below the coal strata, he has also the legal right to grant such a right to others, and, in my opinion, the oil operator or gas driller has a right to place his machinery upon the surface, pursuant to the terms of his grant or lease, and drill through the coal strata to the oil or gas below, under conditions and regulations of such a character as not to materially injure the coal owner in his rights to remove the coal.

It is also my opinion that where such gas or oil wells are properly cased, the owner of the coal, through which they are drilled, may legally remove the coal adjacent to such pipes in such a manner as not to materially injure or destroy such pipes or wells.

The rights of the coal owner and the gas or oil driller may both be upheld when each, in securing his property, pursues a course that will not unnecessarily injure the other, and it can not matter in the least which of them first received such rights by grant from the surface owner. I return herewith the letter of Mr. Ingle.

I have the honor to be,

Very truly yours,

JAMES BINGHAM,

Attorney-General.

REPORT OF THE STATE NATURAL GAS SUPERVISOR FOR THE YEAR 1910.

By BRYCE A. KINNEY.

LETTER OF TRANSMITTAL.

OFFICE OF GAS INSPECTION DEPARTMENT,
MARION, IND., December 29, 1910.

Hon. W. S. Blatchley, State Geologist of Indiana:

DEAR SIR—I have the honor to submit to you herewith the manuscript of my annual report as State Natural Gas Supervisor, the same being for the 1910 and the nineteenth report issued from this office.

Again acknowledging the cordial support that I have received from you while I have had charge of this office, and thanking you for the same, I am,

Yours sincerely,

BRYCE A. KINNEY,
State Natural Gas Supervisor.

Annual Report of the State Natural Gas Supervisor.

In previous reports I have discussed at length the different phases of the gas situation as it existed in the State of Indiana, and recommended the enactment of laws that would remedy the prevailing evils. My purpose in this report is not to dwell particularly upon those things which are necessary to the preservation of gas fields nor the dangers that confront the producers of gas in the Indiana field, but to give the people of the State an idea of the present conditions of the field and the good that has been wrought by this office because of the greater power vested in it by the acts of the Legislature.

It is impossible for this office to give all of the information required, viz., complete and tabulated statistics of the number of gas wells, with the location and record of geological strata passed through in drilling them; the value of gas produced; the rock pressure, increase or decrease in rock pressure and volume of flow; number of miles; capacity and cost of mains laid; cost of gas as a fuel; number of persons employed in the production of gas, for the reason that the field has developed to such an extent that it is not possible for the Supervisor, with his limited number of assistants, to collect the information necessary.

WELL PLUGGING DEPARTMENT.

As stated in previous reports, the most important duties required of this office are to see that the laws of the State in regard to the drilling and plugging of wells and the consumption of gas be enforced. We have never been able to handle this until the last two years. The last Legislature passed a well-plugging law that is very effective and it has done a lot towards improving the field generally. The gas pressure is increasing, also the volume, and the artesian water is not affected by the salt water as it was two years ago. This proves that the well-plugging law that is now in effect will eventually overcome the evil that was wrought before we were able to cope with the difficulties that confronted us. This

law has cost the State practically nothing, as it has been run on the fee system and each man gets what he collects in fees. For every well plugged the owner of said well, or the lessee, pays to the Treasurer of State five dollars. This five dollars is paid over to the deputy who has plugged said well, and in this way the plugging department has not been an expense to the State.

I am not in favor of a fee job of any kind, but it was the only way we could get at this and have a law passed whereby we could protect the field, as we could not ask the State to appropriate money for the benefit of individuals, and the only recourse left us was for the man or person who owned or leased the land to pay the fee. At that time I did not know how much this would amount to, nor how many deputies would be required, so I could not fix a salary for a deputy. Even at this time it is a hard matter to determine just how many men are needed in the plugging department.

OIL FIELD.

During the history of this field there have been 4,000 gas wells drilled and 2,500 of them are now plugged. There is at the present time a daily production of 50,000,000 cubic feet of gas which is worth .20 per thousand, making the daily production of gas in the Indiana field worth $10,000, or over $3,000,000 per year. This gas is produced from twenty-seven different counties, and the field extends from Gibson County on the southern border line to Allen County in the northeast corner, a distance of 250 miles on an air line. The initial pressure runs from 40 pounds to 440 pounds to the square inch. The largest wells are located in Pike County, there being several wells there that will produce more than two million cubic feet a day each.

The southern field has no connection whatever with the northern field. In the northern field, which is known as the "gas belt," gas is produced from what is known as the Trenton rock, which extends from Allen County to Decatur County and as far west as Hendricks County, and to the State line on the east. A well drilled in the Trenton rock may affect another well five miles away; this is one reason the well-plugging law was passed, to prevent the ruining of this Trenton rock field and to protect the oil and gas bearing sand. The fresh water had heretofore been allowed to penetrate the Trenton rock, and this water all had to be handled with pumps and pumped out of the rock before we could reach the gas and oil in this territory. Many wells were ruined here before this law was passed, by the careless plugging.

NEW FIELD.

Conditions in the new field, through Pike and Gibson counties, are much different to those of the old field. The oil and gas is found at a depth of eleven hundred feet, with two layers of salt water, one at about 600 feet and the other at 1,000 feet. This makes the drilling of these wells very slow, as the hole is full of salt water from the time they reach a depth of 600 feet. After reaching 1,000 feet this salt water is cased in with 6½-inch casing and the well is drilled in to the oil sand without reaching any more water. A good "oiler" may be found 500 feet from what is termed a "duster" or a dry hole. A dry hole in the southern field does not indicate that that farm on which it was drilled must be condemned as a dry farm, as there are three different sands in this field—ordinary sand, oil sand and gas bearing sand. The oil seems to lay in pools, also the gas. They are undoubtedly connected in some way, through a crevice, perhaps, but it does not lay in one solid body as the Trenton limestone does. This is a more expensive field to operate. The wells cost more to pipe, they are deeper, and you are not so sure of striking gas and oil in paying quantities. The older oil and gas men throughout the country have great hopes of this field, and are spending thousands of dollars trying to locate what we think will be one of the greatest oil and gas fields that has ever been opened in Indiana. They give this as their reason; Seven years ago the Princeton field was discovered; at this time they had considerable gas there, but the life of this flow was soon extinguished and the oil flowed in until today the wells produce more oil per well than any other field in Indiana outside the new fields now being drilled. This leads the oil and gas men to believe that there is some great pool feeding these wells, and that is why they are spending so much money trying to find the main reservoir. The coming year of 1911 will undoubtedly prove to be the banner year in the history of the Indiana gas and oil field.

There are at the present time no less than 50 strings of tools drilling test wells outside of the field trying to locate this great area which they think exists.

I have included both oil and gas in this report because nine-tenths of the wells now producing oil in the southern part of this State also have plenty of gas to run them, which means a great saving to the oil territory and is the only material that is practical for light and fuel here. The oil men have learned this through experience, as the northern field has practically shut down now on account of the gas failure.

PRESSURE AND FLOW.

The pressure and flow of natural gas varies in different fields and counties; for instance, in some parts of Grant County the pressure runs as low as 20 pounds. In Decatur County it runs as high as 300 pounds, and in Pike County as high as 440 pounds. This variation can easily be accounted for. You take a new field and the pressure is gauged usually by the depth of the well; for instance, in a well 1,100 feet deep you will find the rock pressure between 420 pounds and 480 pounds, which means 40 pounds to one hundred feet. In the oil field where the sand has been penetrated with fresh water and salt water, the gas has not the heat units that the dry gas has in the new field and the water in the gas must affect the pressure. This is the only reason we can give.

In the Trenton rock field you can gauge a well to within ten pounds of what it would actually gauge by the depth of the well. A well 900 feet deep would test about 360 pounds, and that is about what the natural pressure was in the northern field when this field was new.

In Oakland City 522 pounds has been the highest in the well on the M. Burnett farm. This well was tested by me in April, 1908, and had a capacity of 5,000,000 cubic feet and was about 1,150 feet deep. This well was above the average in flow and in pressure and is supplying gas to drillers at the present time.

This field was been watched very carefully by this office and the wells in this field are in very good condition. Where gas only is found the well is immediately closed and kept closed and used for gas only. At the present time the outlook is very bright for several cities to be connected with gas in southern Indiana, namely, Evansville, Washington and Princeton. Of course, Princeton is a city that has been piped for years, but the pressure and the volume has decreased to such an extent that they have had to add an artificial plant to supply the consumers. Several gas men throughout the State have their eyes on this field for a proposition to pipe gas to these cities, and this will undoubtedly be done within the next year. This will mean a great deal for southern Indiana, as it will induce factories to go there and it will be a great convenience for the people at large.

EXPERIENCE A TEACHER.

The people of the State of Indiana have profited by experience in the use of natural gas. In the old days when the natural gas field was booming, the northern part of the State thought we would

never exhaust the supply. They would open their windows, and never think of turning the fire down. Hundreds of farmers had great flambeau lights in their yards and in front of their homes and burned thousands of feet of gas in this way. These lights burned night and day until the Legislature passed what is known as the "Flambeau Law." Meters were unknown at that time; everybody burned what they wanted to, usually at a flat rate, for a dollar or two dollars a stove.

It is the fault of the people and not the fault of this department that the gas of Indiana had failed in what is known as the "gas belt." A great many things have been expected of this department that it was impossible for it to do, such as make laws to protect this precious fuel from being piped out of the State, and trying to regulate the use of gas without the help of the people at large.

The first great mistake made in Indiana regarding the gas and oil, especially the gas, was by the farmer in writing up his contract with the gas corporation. When he leased his farm if he had inserted in this document a clause that would prevent the lessee from piping this gas out of the State or prohibited them from using artificial means whereby they could increase the natural flow, this evil would never have existed and would have saved this department a lot of litigation.

GAS MAINS.

This department has made an extra effort in the last two years to see that all gas mains are in good condition, and we believe that at this time the gas mains and the gas plants in the State of Indiana are in excellent condition, and we feel safe in saying that 50,000,000 cubic feet of gas are being used at the present time.

PIPE LINES.

There is a great deal of gas being pumped throughout the State today, the Fairmount and Greentown pumping stations being still in existence and pumping gas to Chicago.

Anderson, Richmond, Shelbyville and Knightstown and numerous other cities are being supplied with gas by the assistance of pumps.

It has always been my opinion that if a law had been enacted to prohibit the pumping of this gas there would be as much gas used today by its natural flow as there is by the artificial means. However, the gas companies have been allowed to do this, the law being repealed some years ago which prohibited them from doing

this. I have taken the proposition up with the Legislature several times, but have never been able to have the law re-enacted. For the good of the people of the State such a law should be in existence today, and would not only benefit what is known as the gas producing rock but would be of great benefit to the people, as the life of this flow would be prolonged if it were allowed to come to the surface by its natural flow.

There are hundreds of thousands of dollars invested in pipe lines, and it is not the intention of this department to take away from the owners anything that rightfully belongs to them; but this, we think, belongs to the people at large and not to any individual. For five miles about these pumping stations a vacuum is being created and gas is being drawn from under land on which no rental is being paid by these corporations. The only way this can be remedied is for the Legislature to enact laws to prohibit the use of these great vacuum pumps, and this department suggests that such a law be enacted.

The money that is invested in the 1,500 wells producing gas in Indiana amounts to more than $15,000,000. This is a low estimate, and more wells are being drilled every day, which proves that this has been a great industry and will undoubtedly be the cheapest and best fuel for parts of the State for several years to come.

REPORT OF THE STATE INSPECTOR OF MINES FOR THE YEAR 1910.

By JAMES EPPERSON.

CONTENTS.

LETTER OF TRANSMITTAL.

OFFICE OF INSPECTOR OF MINES,
INDIANAPOLIS, IND., March 11, 1911.

Prof. W. S. Blatchley, State Geologist:

DEAR SIR—I have the honor to submit to you herewith my twelfth annual report as Inspector of Mines, covering the calendar year of 1910, and being the thirty-second annual report of this department and twentieth made to the Department of Geology and Natural Resources.

I trust it will receive your approval and be found worthy of consideration by the public.

JAMES EPPERSON,
Inspector of Mines.

Thirty-Second Annual Report of the Inspector of Mines for the State of Indiana.

In preparing this report the subject-matter contained herein is treated under the following captions:

Production of Coal, Condition of Coal Trade, Condition of Labor, Mine Casualties to Mine Employes, and Mine Property and General Information Relating to the Mining Industry for the Year Ending December 31, 1910.

Each of these subjects has been treated in a manner such as we think should meet the requirements of the general public and those directly interested in the business of mines and mining.

Reference to each of the subjects included in the report may be found in the following summary, which contains all the important totals and averages for the year:

SUMMARY OF TOTALS AND AVERAGES FOR THE YEAR 1910.

Number of coal producing companies	18
Number of counties operating shipping mines	12
Number of coal seams operated	6
Number of coal companies organized	15
Total number of companies operating in the State	104
Number of new block coal mines opened	5
Number of new bituminous mines opened	8
Number of block coal mines abandoned	6
Number of bituminous mines abandoned	10
Number of block coal machine mines in operation	4
Number of block coal hand mines in operation	26
Number of block coal hand mines idle during the entire year	2
Number of block coal machine mines idle during entire year	0
Number of bituminous hand mines in operation	73
Number of bituminous machine mines in operation	64
Number of bituminous hand mines idle during entire year	12
Number of bituminous machine mines idle during entire year	1
Total number of machine mines in the State	69
Total number of hand mines in the State	113
Total number of mines employing more than ten men	182
Number of miners, block hand mines	992
Number of inside day and monthly men in block hand mines	312

Number of outside day and monthly men in block hand mines	116
Total number of block miners, in block machine mines	92
Number of machine runners and helpers, block machine mines	44
Number of loaders, block machine mines	168
Number of inside day and monthly employes, block machine mines	100
Number of outside day and monthly employes, block machine mines	47
Total employes, block mines	1,871
Number of miners, bituminous hand mines	5,923
Number of inside day and monthly employes, bituminous hand mines	1,593
Number of outside day and monthly employes, bituminous hand mines	605
Total number of hand miners, bituminous machine mines	1,699
Number of machine runners and helpers, bituminous machine mines	1,058
Number of loaders, bituminous machine mines	4,834
Number of inside day and monthly employes, bituminous machine mines	2,652
Number of outside day and monthly employes, bituminous machine mines	936
Total number of employes, bituminous mines	19,300
Total number of mine employes in the State	21,171
Number of mules used, block mines	152
Number of mules used, bituminous mines	1,558
Total number of mules used in all mines	1,710
Number of kegs of powder used in block mines	50,624
Number of kegs of powder used in bituminous mines	538,006
Total number of kegs powder used in the State	588,626
Aggregate number of days block coal mines were operated	4,672
Average number of days, per mine, block machine mines were operated	207
Average number of days, per mine, block hand mines were operated	148
Aggregate number of days bituminous mines were operated	28,572
Average number of days, per mine, bituminous hand mines were operated	193
Average number of days, per mine, bituminous machine mines were operated	226
Tons hand mined block coal	640,946
Tons machine mined block coal	234,513
Total tons of block coal produced	875,459
Tons of hand mined bituminous coal, produced	6,595,931
Tons machine mined bituminous coal produced	10,653,854
Total production of the State	18,125,244
Tons block coal shipped outside the State	608,541
Tons block coal consumed in the State	266,918
Tons block coal shipped outside the State	608,541

Tons bituminous coal consumed in the State	8,235,655
Tons bituminous coal shipped outside the State	9,889,589
Total tons of coal consumed in the State	8,235,655
Wages paid to block coal miners	$784,377 20
Wages paid to inside day and monthly employes, block mines	296,601 52
Wages paid to outside day and monthly employes, block mines	128,215 88
Total wages paid to block coal employes	1,209,194 60
Wages paid to bituminous miners	9,809,610 82
Wages paid to inside day and monthly employes, bituminous mines	3,363,368 28
Wages paid to outside day and monthly employes, bituminous mines	1,145,217 02
Total wages paid to bituminous mine employes	14,318,196 12
Grand total wages paid to mine employes	15,527,390 72
Average earning per mine employe for the year	733 42
Total average cost per ton for mining block coal	1 38
Total average cost per ton for mining bituminous coal	83
Total average cost per ton for entire production of State	86
Total money expended on improvements	24,868 37
Number of fatal accidents	51
Number of permanent accidents	6
Number of serious accidents	505
Number of minor accidents	1,009
Total number of accidents to mine employes	1,571
Number of accidents to mine property	9

PRODUCTION OF COAL, COAL TRADE AND MINING CONDITIONS.

A review of the mining industry in Indiana for the year 1910 discloses a most gratifying condition in all the many branches of the industry. A larger increase in the production of coal, stronger and steadier market demands, a higher average selling price for all grades of coal, the highest average wages earned by mine employes, fewer strikes and a much larger tonnage per each fatal, permanent or serious accident to mine employes are shown than in any preceding year in the history of the State.

All the mines in the bituminous field, except one or possibly two very small producing mines, were idle pending a settlement of a wage agreement from April 1 to May 5. Work in the block coal field, however, continued uninterrupted after April 1, the miners continuing to work pending a settlement of the wage scale, which was effected early in the month.

PRODUCTION.

Notwithstanding this idle time, the total production for the year was 18,125,244 short tons, an increase of 4,433,155 tons, or a fraction over 32.3 per cent., over 1909, the highest previous year in production.

A certain per cent. of this large increase came from every county in the State except Fountain and Perry counties, with one mine each, which were idle or working less than ten men. The largest increases came from Sullivan, Vigo, Greene, Vermillion and Knox counties, and was produced by machine mines. Sullivan, with an increase of 1,538,603 tons, shows the largest increase of all the counties.

The following table exhibits the relative rank of the twelve counties in the number of tons produced in 1910:

Tons of Coal Produced and Wages Paid to Miners in Indiana in 1910 by Counties.

COUNTY.	Tons Produced.	Wages Paid.
Sullivan	4,339,173	$3,703,122 05
Vigo	4,116,981	3,612,856 18
Greene	3,241,690	2,532,927 19
Vermillion	1,676,281	1,446,481 10
Knox	1,045,868	720,091 71
Clay	948,402	1,064,757 19
Parke	727,727	780,260 75
Warrick	701,390	559,108 79
Pike	599,952	485,978 48
Vanderburgh	369,987	295,534 48
Gibson	285,101	255,286 61
Daviess	72,692	70,986 19
Total	18,125,244	$15,527,390 72

Of the total production there were 17,249,785 tons of bituminous and 875,459 tons of block coal.

DISTRIBUTION OF PRODUCT.

Of the bituminous coal, 7,968,737 tons were consumed in Indiana and 9,281,048 tons were shipped to other States, and of the block coal, 266,918 tons were consumed in Indiana and 608,541 tons shipped to other States, or a fraction over 54.56 per cent. of the entire production shipped to other States, while in 1909 but 42.6 per cent. of the production was shipped to other States.

The aggregate wages reported for the year was $15,527,390.72, an increase of $4,147,339.68, or a fraction over 36.4 per cent. for 1910 over 1909.

COST OF PRODUCTION.

The aggregate wages reported from the bituminous field was $14,318,196.12, making a fraction over 83 cents per ton for the labor cost for total production of bituminous coal.

The total wages from the block field was $1,209,194.60, or a fraction over $1.38 per ton for labor cost for total production of block coal.

MARKET PRICES.

The market prices for bituminous coal during the period from January 1 to April 1 (except yearly contracts) ranged from $1.15 to $1.75 per ton for mine run f. o. b. cars at mine, the highest prices prevailing during the month of March. More coal was produced in this month than in either of the two months preceding; $1.40 would probably be a fair average selling price for this period. From May 1 to October 1 prices ranged from $2.50 down to $1.35; in a few instances the prices reached $2.75, but taking the bituminous field as a whole, $1.95 per ton would be a fair average for that period. From October 1 to January 1 prices fluctuated considerably, ranging from $1.35 to $1.50, and as low as $1.15 per ton; $1.35 would be a fair average for this period, or a probable average of $1.60 per ton for mine run bituminous coal for the year. Market prices for block coal ranged from $2.25 to $3.25 per ton f. o. b. R. R. cars at the mines, giving $2.75 as a fair average for the year.

EMPLOYES.

The total number of mine employes reported for the year was 21,171, an increase of 2,263 over 1909. Of this number 19,300 were bituminous and 1,871 block coal employes.

AVERAGE WAGES OF EMPLOYES.

The total wages reported from the bituminous field being $14,318,196.12 shows an average earning of $741.87 for each bituminous mine employe, and the total wages paid to block mine employes being $1,209,194.60 shows an average earning of $646.27 for each block coal employe; the aggregate wages for the State being $15,527,390.72 and the total number of employes in the State 21,171, shows an average earning of $733.42 for each mine employe in the State.

The average wages of all classes of mine employes, the block and bituminous mines each shown separately, are given in the following table:

TABLE

Exhibiting the Number of Miners, the Number of Inside Day and Monthly Employes, the Number of Outside Day and Monthly Employes, the Total Wages Earned by Each Class of Labor, and the Average Earnings per Employe in the Block and Bituminous Mines, Each Shown Separately.

BLOCK COAL HAND MINES.

County.	Number of Miners.	Total Wages.	Average Wages.	Inside Employes.	Total Wages.	Average Wages.	Outside Employes.	Total Wages.	Average Wages.
Clay	681	$388,742 69	$570 84	222	$158,299 99	$713 06	85	$64,821 34	$762 60
Parke	311	213,045 05	685 03	90	61,222 41	680 25	31	36,054 33	1,163 04
General average for block hand mines	992	$601,787 74	$606 64	312	$219,522 40	$703 60	116	$100,875 67	$869 61

BLOCK COAL MACHINE MINES.

Parke	39	$8,578 78	$219 98	16	$3,710 16	$231 88	10	$2,951 86	$295 18
Vigo	265	174,010 68	660 42	84	73,368 96	873 44	37	24,388 35	659 15
General average for block machine mines	304	$182,589 46	$600 62	100	$77,079 12	$770 79	47	$27,340 21	$581 71
General average for all block mines	1,296	$784,377 20	$605 23	412	$296,601 52	$719 91	163	$128,215 88	$791 46

BITUMINOUS HAND MINES.

County.	Number of Miners.	Total Wages.	Average Wages.	Inside Employes.	Total Wages.	Average Wages.	Outside Employes.	Total Wages.	Average Wages.
Clay	155	$101,755 16	$656 48	30	$21,676 28	$722 54	15	$11,026 92	$735 13
Daviess	113	57,891 28	512 31	27	6,853 53	253 83	15	6,241 38	416 09
Fountain	Idle								
Gibson	188	173,669 93	923 78	78	50,117 83	642 54	22	31,498 85	1,431 77
Greene	458	343,409 10	749 80	128	70,491 37	550 71	56	36,482 67	651 48
Knox	47	33,891 65	721 10	9	7,583 11	842 57	6	4,760 37	793 39
Parke	230	108,106 55	470 03	76	34,420 60	452 90	22	11,604 16	527 46
Perry	Idle								
Pike	492	257,987 04	524 37	96	70,482 18	734 19	41	29,066 47	708 94
Sullivan	460	318,270 91	691 89	172	108,385 58	630 15	90	48,980 34	544 23
Vanderburgh	304	200,160 41	658 42	90	63,304 45	703 38	52	32,069 62	616 72
Vermillion	1,042	829,447 42	796 01	265	243,218 19	917 81	80	48,185 49	602 32
Vigo	2,193	1,558,396 98	710 62	569	500,563 06	879 72	172	143,665 70	835 27
Warrick	241	145,128 25	1,085 41	53	66,268 46	1,250 35	34	17,308 58	509 08
General average for bituminous hand mines	5,923	$4,128,114 68	$696 96	1,593	$1,243,364 64	$780 52	605	$420,890 55	$695 69

BITUMINOUS MACHINE MINES.

Clay	316	$208,214 18	$658 91	86	$76,357 79	$887 88	35	$33,862 84	$967 51
Greene	1,979	1,411,664 39	713 32	688	500,801 03	727 91	204	170,078 63	833 71
Knox	608	479,329 32	788 37	165	136,616 79	827 98	63	57,910 47	919 21
Parke	242	185,490 56	766 49	99	83,266 61	841 08	39	31,809 68	815 63
Pike	123	87,483 64	711 25	25	26,427 81	1,057 11	17	14,531 34	854 78
Sullivan	2,570	2,045,715 43	795 99	1,073	903,600 22	842 12	388	278,169 57	716 93
Vermillion	286	228,401 84	798 61	83	78,193 83	942 09	33	19,034 33	576 79
Vigo	1,143	798,897 11	698 94	356	258,036 22	724 82	95	81,529 12	858 20
Warrick	324	236,299 67	729 32	77	56,703 34	723 42	62	37,400 49	603 23
General average for bituminous machine mines	7,591	$5,681,496 14	$725 57	2,652	$2,120,003 64	$799 40	936	$724,326 47	$773 85
General average for hand bituminous mines	5,923	$4,128,114 68	$696 96	1,593	$1,243,364 64	$780 52	605	$420,890 55	$695 69
General average for the State	14,810	$10,593,988 02	$715 32	4,657	$3,659,969 80	$785 91	1,704	$1,273,432 90	$747 32

ACCIDENTS TO EMPLOYES.

It is pleasing to note that notwithstanding an increase of 4,433,155 tons of coal produced in 1910 over 1909, and an increase of 2,263 in the number of employes, among which were a large number of miners, drivers, timbermen, machine runners, helpers and shot firers, all of which occupations are among the most hazardous in connection with mining; also that the increased tonnage mined necessitated a large increase in the amount of explosives used, one of the most dangerous factors in the production of mine accidents both directly and indirectly, and the greater the number of tons of coal excavated the greater the space of roof uncovered or exposed, thus increasing the danger of accidents from falls of slate or rock—in fact, an increase in every avenue of danger incident to coal mining—there was but one more fatal, two less permanent and twenty less serious accidents reported for the year 1910 than in 1909. The comparative table given in this report exhibiting the number of tons of coal produced, number of employes, number of fatalities and tons per fatality shows 51 fatalities for 1910 and 18,125,244 tons of coal produced, or 355,397 tons for each fatality. These figures show an increase of 71,551 tons per each fatality for 1910 over 1909, which year had a higher tonnage per fatality than any previous year. This record, so far as we can learn, is not equaled in the United States, not, for that matter, in the world.

STRIKES AND SUSPENSIONS.

There were but few strikes during the year 1910 except those affecting only individual mines, and those occurring were usually of but a few days' duration.

The same may also be said of suspension, with but one exception. The mines of District No. 11, representing the bituminous field of Indiana, suspended work April 1st pending a settlement of the yearly wage agreement. During the suspension several features were developed that tended very much toward a strike. The operators were not permitted to work any employes on necessary repairs nor in any other capacity except pumpers and engineers. A settlement was finally agreed upon, a scale governing wages, conditions, etc., signed, effective during the scale years from August 1, 1910, to April 1, 1912, and the mines, those that were in condition, resumed operations May 4th and 5th. Many of the larger mines, though, as a result of the operators having been refused

permission to make necessary repairs during the suspension, were unable to hoist coal for several weeks.

In the Block Coal field an agreement was arrived at before April 1st and work in that field continued uninterrupted.

We give herewith copies of the Terre Haute and Brazil agreements:

TERRE HAUTE AGREEMENT.

Arranged and Adopted By and Between the United Mine Workers of District 11 and the Indiana Bituminous Coal Operators' Association, Effective during the Scale Years from August 1, 1910, to April 1, 1910.

It is hereby agreed:

ARTICLE I.

Section 1. That the bituminous coal district of Indiana shall pay fifty-eight (58 cents) per ton for all mine-run coal loaded and shipped as such. All other coal mined in that district shall be passed over regulation screen, and be paid for at the rate of ninety-five cents (95 cents) per ton of two thousand (2,000) pounds for screened lump.

Sec. 2. The standard height of coal in Indiana shall be 3 feet 3 in. in mines opened prior to April 1, 1901, and in mines opened since April 1, 1901, the standard height shall be 3 feet 6 inches. All coal less than 3 feet 3 inches in thickness and over 2 feet 9 inches, the price shall be 103 cents per ton for screened lump coal, and 67 cents per ton for mine-run coal. All coal less than 2 feet 9 inches and down to 2 feet 6 inches, the price shall be 111 cents per ton for screened lump coal and 68 cents per ton for mine-run coal.

Sec. 3. That the screen hereby adopted for the bituminous district of Indiana shall be uniform in size, six (6) feet wide by twelve (12) feet long, built of flat or Akron-shaped bar, of not less than five-eighths (⅝) of an inch surface, with one and one-fourth (1¼) inches between bars, free from obstructions, and that such screens shall rest upon a sufficient number of bearings to hold the bars in proper position.

ARTICLE II.

Machine Mining.

Price per ton for Machine Mining for Punching Machine, Vandalia Track and north thereof:

Section 1. Screened Lump-Runner, 12.1 cents; helper, 11.1 cents; loading, shooting and timbering, 52.8 cents; total 76 cents.

Sec. 2. Run of Mine-Runner, 8 cents; helper, 7½ cents; loading, shooting and timbering, 32½ cents. Total, 48 cents.

South of Vandalia Track:

Sec. 3. Screened Lump-Runner, 11 cents; helper, 10 cents; loading, shooting and timbering, 55 cents. Total, 76 cents.

Sec. 4. Run of Mine-Runner, 7 cents; helper 6½ cents; loading, shooting and timbering, 34½ cents. Total, 48 cents.

For Chain Machine.

Sec. 5. Screened Lump-Runner, 6.6 cents; helper, 6.6 cents; loading, shooting and timbering, 59.3 cents. Total, 72½ cents.

Sec. 6. Run of Mine-Runner, 4.3 cents; helper, 4.3 cents; loading, shooting and timbering, 36.9 cents. Total, 45½ cents.

Sec. 7. Machine shovels shall be furnished by the operators, but when replaced the old shovels must be returned, and in case of careless breaking or destruction, the helper shall pay for the shovel so destroyed. Coal companies shall also furnish coal shovels for the machines, when the use of such shovels is demanded by the company.

Day Work for Punching Machines.

Sec. 8. Machine work, when paid for by the day, shall be, for machine runner, $3.34.6; helper, $2.70.2.

Day Work, Chain or Cutter Bar Machine.

Sec. 9. When paid for by the day, shall be, for machine runner, $3.17.7; helper, $3.17.7.

Day work by machines shall apply only to opening new mines and defective work, such as horse backs, etc.

ARTICLE III.

Yardage and Room Turning, Machine.

Section 1. In entries 7 to 9 feet wide, $1.41; in entries 12 feet wide, five-eighths of price of narrow entries, or 88 cents.

Narrow work after punching machines shall be sheared when demanded by the operator. Narrow work after the chain machine must be done in a workmanlike manner.

Sec. 2. Break-throughs between entries same as entry prices. Break-throughs between rooms shall be paid for at same price when similarly driven.

Sec. 3. In narrow entries and narrow break-throughs between entries in chain machine mines, the loader shall receive $1.24 per yard and the machine runner and helper each 8½ cents per yard, and in wide entries the same proportion. In entries and break-throughs between entries in punching machine mines the loaders shall receive $1.20 per yard and the runner and helper each 10¾ cents per yard, except where coal is sheared, in which case the runner and helper shall receive all the yardage, and where machines are worked by the day the loaders shall receive all the yardage.

Room Turning—Machine Mines.

Sec. 4. Room turning, $3.56. Room necks to be driven 12 feet in and widened at an angle of 45 degrees when so desired by operators. Any distance in excess of above shall be paid for proportionately, but no room neck shall exceed 15 feet. When room necks are driven 12 feet wide, price shall be five-eighths of regular prices, or $2.22.

ARTICLE IV.

Yardage and Room Turning—Pick Mines.

Section 1. Narrow entries 7 to 9 feet wide, $1.97 per yard. Wide entries 12 feet wide, $1.23 per yard.

Sec. 2. Wide entries shall not be more than 13 feet nor less than 11 feet. In the event of a 10 or 11 feet entry being demanded by the operator, narrow entry prices shall be paid, if 14, 15, 16, or 17 feet entries are demanded the wide price shall be paid.

Sec. 3. Break-throughs between entries shall be paid for at entry prices. Break-throughs between rooms, when sheared or blocked, shall be paid for at entry prices, but no break-throughs shall be driven without consent of the operator. Nothing herein shall interfere with the law governing break-throughs.

Sec. 4. Room turning, $4.75. Room necks to be driven 12 feet in and widened at an angle of 45 degrees when so desired by the operator. Any distance in excess of above shall be paid for proportionately, but no room neck shall exceed 15 feet. When room necks are driven 12 feet wide, the price shall be five-eighths of regular price, or $2.97, and the right of the operator to drive an 18 foot room when necessary shall not be questioned.

Sec. 5. The price for mining herein agreed to for pick and machine work shall include all labor necessary to cut the coal, drill and blast the same, load it on the miner's car and properly care for and timber the miner's working place, and no division of the scale shall carry any exception to this rule. In case a miner fails to properly timber, shoot, and care for his working place so that any of the company's property is injured, the miner whose fault has occasioned such damage shall repair the same without compensation: Provided, however, that where shot-firers are employed and partially paid by the company the condition shall continue during the life of this agreement.

Blacksmithing.

Sec. 6. Price of blacksmithing shall be 1¼ cents on the dollar. Sharpening shall be done in a workmanlike manner and men shall not have to wait for their tools.

ARTICLE V.

Day Labor.

Section 1. The wages of inside day labor shall be $2.70 per day and eight hours where and when men are employed, except as herein provided.

Sec. 2. The wages of spike team driver shall be $2.95 per day. The drivers shall take their mules to and from the stables, and the time required in so doing shall not include any part of the day's labor, their work beginning when they reach the change at which they receive empty cars, but in no case shall a driver's time be docked while he is waiting for such cars at the point named.

Sec. 3. The wages of motormen shall be $3.17 per day, and trappers $1.25 per day.

Sec. 4. The wages of outside men except as herein provided shall be $2.13 per day of eight hours on and north of the B. & O. S. W. R. R., and

south of the B. & O. S. W. R. R. the wages shall be 181½ cents per day, with 10½ cents per day in addition thereto commencing April 1st, 1911, and each year thereafter until the scale south equals that north of the B. & O. S. W.

Sec. 5. The wages of engineers, blacksmiths and firemen south of the B. & O. S. W. R. R. shall be increased 5.55 per cent. on the wages being paid March 31st, 1911, plus 25 per cent. of any difference then existing in wages paid south and the scale of wages provided for the north and 25 per cent. of said difference shall be added annually thereafter commencing April 1, 1911, until the scale south equals that paid north of said B. & O. S. W. R. R.

Sec. 6. The blacksmiths' wages shall be $3.10 per day of nine hours at all mines north of the B. & O. S. W. R. R., and in addition to their ordinary duties all blacksmiths shall do any other labor required of them by the mine management: Provided, however, that they shall receive their regular wages therefor.

Sec. 7. All day men shall at all times do and perform any and all kinds of labor required of them by the mine management: Provided, however, that on idle days men shall have an equal division of the work they usually perform when the mine hoists, and where men are employed as drivers, cagers and motor men they shall have an equal share of all extra work, such as cleaning roads, getting in rails, timber or any other work required of them, when the same does not interfere with the work of other men, and day work shall be done on idle days and in cases of emergency or overtime.

Sec. 8. In the absence of any driver, any miner who can drive shall be expected to do so when requested. Any miner leaving his place to drive shall be permitted to load one car for each day that he drives.

Sec. 9. All day laborers working at the mines, excepting weighmasters, head flat-trimmer, dumper, fire-bosses and boss-drivers who shall be regarded strictly as company men, shall be recognized as members of the U. M. W. of A. In emergencies or in the absence of any regular employe the right of the operator to employ men not members of the U. M. W. of A. for outside day labor shall not be questioned. Any and all flat-trimmers shall dock for dirty coal.

Section 10. That the above scale is based upon an eight-hour work-day; that it is definitely understood that this shall mean eight hours' work at the face, exclusive of the noon time, six days in the week, and that no local ruling shall in any way deviate from this agreement, or impose conditions affecting the same, but any class of day labor may be paid at the option of the operator for the number of hours and fraction thereof actually worked at the hour rate, based on one-eighth of the scale rate per day: Provided, that when men go into the mine in the morning they shall be entitled to two hours' pay whether the mine works or not, excepting in event of a mine being closed down by action of any member or members of the U. M. W. of A., the two hours' pay shall be forfeited.

ARTICLE VI.

Engineers' Wages and Their Duties.

The engineers' wages shall be:

Section 1. First engineer, $89.05; second engineer, $77.19; third engineer, $71.25.

Sec. 2. Eight hours shall constitute a day's work, but the engineers shall outside of regular hours, hoist and lower the men, and in addition shall perform all the duties which necessarily and usually pertain and belong to an engineer's position, and shall not receive any extra pay therefor. It is agreed further that no hoisting engineer shall be subjected to the interference or dictates of the mine committee nor the local unions, but all the differences between the engineer and his employer shall be adjusted by the officers of the U. M. W. of A., and employer interested.

Sec. 3. In case of either local or general suspension of mining either at the expiration of this contract, or otherwise, the engineers shall not suspend work, but shall, when mining is suspended, fully protect all of the company's property under their care, and operate fans and pumps, and lower and hoist such men, mules or supplies as may be required, and any and all coal required to keep up steam at the company's coal plants, but it is understood and agreed that the operators will not ask them to hoist any coal produced for sale on the market, and there shall be no change in engineers' wages during the suspension.

Sec. 4. All hoisting engineers at pick mines shall do the firing where the production does not exceed 300 tons of coal per day, and at machine mines in process of development until the production shall have reached 200 tons per day. Engineers shall do the firing on idle days at the option of operator, except when dynamos or compressors are being run to furnish power to operate mining machines to cut coal, but the services of the fireman shall not be dispensed with where a mine cease hoisting coal in the midst of a shift.

Sec. 5. The wages of firemen shall be: Per day of 10 hours, $2.58½; per month, $68.60; per night of 12 hours, $2.48; per month, $67.02. The day firemen shall do and perform any service required of them by the mine management, and shall be entitled to an equal division of labor, with other outside day men on idle days at such labor as they are competent to perform, and the night fireman, or watchman, in addition to his other duties, shall be responsible for the pumps within a distance of 250 feet from the main shaft bottom, and shall go into the mine when necessary to start them.

ARTICLE VII.

Dead Work.

Section 1. It is agreed that the companies shall have the working places as dry as local conditions will permit, and said working places shall be in working condition at time of starting work in the morning. If any company shall fail to have said working places dry or reasonably so one hour after starting time two successive days, the company shall, if said failure is traceable to neglect or carelessness of the company's agent, give miners so affected other work or pay him or them for time so lost.

Sec. 2. The question of slate in or over the coal, shall be, and is regarded a local question to be taken up and adjusted by the methods provided in the annual Terre Haute agreement for the settlement of disputes: Provided, however, that established usages and prevailing conditions shall not be changed except in new mines where they have not been considered and adjusted.

Sec. 3. Where bottom coal is excessively hard to take up, the operator shall have the option. If he demands that it be taken up he shall pay extra therefor: Provided, that where coal so left shall exceed 4 inches in thickness it shall be taken up by the loaders and paid for by the machine men, but this shall not apply when caused by sulphur boulders, rock, or any unusual condition. And whenever there shall arise a dispute between any loader and boss, or committee and boss as to whether the bottom coal in any room is "excessively hard," the company interested shall select a man who shall take up one-third of such bottom coal, and if by such test it requires more than forty minutes to take up all the bottom coal in such room, then the loader shall be paid at the rate of 33¾ cents per hour for such time so required in excess of forty minutes. This is to apply to the No. 4 vein of Linton coal.

Sec. 4. In mines where it is necessary to remove top or bottom in working places, commonly known as brushing, the following scale shall be paid:

Sec. 5. When necessary to shoot top or bottom in entries 9 inches in thickness, 47 cents per yard, and 5 1/9 cents per inch per yard for any additional thickness. In rooms where necessary to shoot 9 inches in thickness, 37.9 cents per yard, and for each additional inch 4 2/9 cents.

Sec. 6. When brushing is necessary and can be done without shooting the price in entries shall be 4 2/9 cents per inch per yard, and in rooms, 3 1/10 cents per inch per yard.

Sec. 7. No brushing shall be done nor paid for without ordered and amount specified by the mine boss. The miner doing the brushing in entries shall load or "gob" the same as directed by the mine boss. In rooms the miner shall "gob" the refuse. Brushing shall be six feet wide in entries and five feet wide in rooms.

Where material is so hard that the drilling cannot be done with regular machine or churn drill, the above scale does not apply.

ARTICLE VIII.

General.

Section 1. When the coal is paid for mine-run it shall be mined in as good condition as when paid for on a screened lump basis, and when loaded on the miner's car, it shall as nearly as possible be free from slate, bone coal or other impurities. Any miner loading impurities with his coal in such quantities as to show intent, or gross negligence, shall for the first offense be fined 50 cents; for the second offense 75 cents; for the third and each subsequent offense in the same pay, $1.00. Such penalties to start with each pay. The fine so collected to be held in the office of the operator until the local votes a donation to some member who has been injured, ill or has met with some misfortune, which will entitle him to assistance from the

local. In case of dispute, the impurities will be kept until the case is settled.

Sec. 2. Wages shall be paid semi-monthly on or before the 10th and 25th of each month.

Sec. 3. The time of beginning work in the morning and the length of intermission at noon shall be considered a local question which must be so arranged as to secure eight hours' work per day.

Sec. 4. The duties of the mine committee shall be confined to the adjustment of disputes between the mine boss or superintendent and any of the members of the United Mine Workers of America working in and around the mines. The mine committee shall have no other authority, nor exercise any other control, nor in any way interfere with the operation of the mine, and for violation of this clause the committee or any member thereof shall be discharged.

Sec. 5. It is agreed that if any differences arise between an employer and employe in or about the mines, an attempt shall be made to adjust the same by the person or persons affected, with the company's representative in immediate charge. If they fail to agree the question shall be referred to the mine boss and mine committee. If they fail to agree it shall be referred to the mine superintendent and mine committee. If they fail to agree it shall be referred to the President of District 11, U. M. W. of A., and the Secretary of the Indiana Bituminous Coal Operators' Association, whose decision shall be final. It is imperative on the part of the two officials to reach an agreement on all questions referred to them and that the dispute shall be settled within five days, unless longer time is agreed to by the two officials named: Provided, that nothing in this clause shall prevent the district officers from taking up for adjustment any dispute with the officers of the company affected.

Sec. 6. That pending negotiations the miners shall not cease work because of any dispute, and an agreement reached at any stage of the proceedings shall be binding on both parties thereto, and not subject to review or revision of any other party or branch of either association.

Sec. 7. That under no circumstances will the operators recognize or treat with a mine committee or any representative of the United Mine Workers of America during the suspension of work contrary to this agreement.

Sec. 8. No restriction shall be placed on the amount of coal which machines may mine, nor upon the number of places in which machines may cut, nor upon the number of loaders that may work after one machine, nor upon the amount of narrow work that any machine runner may be required to do, nor upon the number of cars that any miner may load in any specified time.

Sec. 9. The operators shall have the privilege of working a night shift for cutting coal with machines. All men so employed shall be paid 28 cents extra for each eight hours' work at night, in addition to the scale price per ton.

Sec. 10. Work on driving entries and drawing pillars may be by double shift at the option of the operator.

Sec. 11. This contract shall in no case be set aside because of any rules of any local union of the U. M. W. of A. Nor shall there be any

rules made controlling or affecting the operations of the mines nor shall any change be made in accepted rules without the operators and miners first consulting and agreeing thereto.

Sec. 12. All local rules in violation of this contract shall be null and void, and no local union nor group of local unions shall pass any rules in violation, neither shall any company enforce any rule in violation of this contract.

Sec. 13. Coal may be dumped as slowly as the operator may find necessary to thoroughly screen it, even if the car is brought to a stop, but it shall not be dumped in such a way as to throw the coal over the car door or unnecessarily break it.

Sec. 14. Any miner knowing his place to be unsafe, shall protect same without delay and shall go into the mine for that purpose outside of regular hours and on idle days.

Sec. 15. Men shall work double in wide entries at option of operator in developing the mine or for running entries for purpose of increasing production.

Sec. 16. Where three places are now given to two loaders the custom shall continue.

Sec. 17. No more than three places for two men nor two places for one man shall be allowed. In mines where the coal averages 6 feet high or over, rooms 30 feet wide or over equipped with two tracks shall be considered double places, and two loaders may be limited to two such places.

Sec. 18. In Sullivan County where men work double in two rooms 25 to 30 feet wide with track up the center, the custom shall continue.

Sec. 19. Whenever a new mine is opened it shall be governed by the same rules existing in other contiguous mines in the same vein of coal.

Sec. 20. The price of powder shall be $1.75. The miners agree to purchase the powder from their operators, provided it is furnished of standard grade and quality, that to be determined by the operators and expert miners jointly where there is a difference.

Sec. 21. It is further agreed that the operator shall deliver the powder to the working places of the miners, and will use all reasonable precautions to insure a safe delivery of same, and will co-operate with the mine committee in tracing powder lost in transit, but shall not in any way be responsible for powder lost, except in case where the loss is caused by the direct negligence of the operator or mine management, and in the event of kegs being broken or powder being caked, powder shall be replaced: Provided, however, that where miners carry their powder from magazine to inlet the practice shall continue.

Sec. 22. All local rules regarding the number of cars required above the tipple south of the Vandalia are hereby abolished, and in lieu of which it is agreed that the operators shall blow the whistle at 8 o'clock in the evening when intending to work the following day, and again at 5 o'clock in the morning if cars are there or promised by the railroad company to be there at 7 o'clock or starting time. If the company blows the whistle at 5 o'clock a. m. without the promise of cars and the miners report for work at 7 a. m. or starting time, and there are no cars, the company shall pay to the local union a fine of $25.00.

Sec. 23. The U. M. W. of A. shall have no jurisdiction nor exercise any control over construction work, such as the erection of tipples or mine buildings, scales, machinery, or screening apparatus necessary to hoist and prepare coal.

Sec. 24. Where dirt must be removed to prepare pillars the miner shall be paid as agreed upon by miner and mine boss, or company, to remove same.

Sec. 25. An employe absenting himself from work for three days without a reasonable excuse, or having notified the mine manager and obtained his consent, may be discharged. This shall mean starting time of the third day.

Sec. 26. All miners shall put down their points and last pair of rails in their working places, and shall nail one end of same, but are not expected to tie and permanently lay their road.

Sec. 27. The chief electrician shall be exempted from control of mine committee or local union, but in case of any dispute between him and the company the district officers shall adjust the same with officers of company involved.

Sec. 28. Where any company operate more than one mine on the same line of road in the same vein of coal, the work between the respective mines shall be as nearly as business conditions will permit equally divided.

Sec. 29. All machine men shall work on idle days at operators' option to make up time lost on previous working days.

Sec. 30. Every miner shall be given an opportunity to load an equal turn with every other miner doing the same class of mining. Where pick and machine miners are working in the same mine the turn shall be in proportion to the ratio between pick mining prices and machine loading prices.

Sec. 31. The check-weighman shall furnish the boss-driver or mine-boss from day to day a turn sheet, and he shall cause the turn to be regulated: Provided, further, that no run or entry in machine mines shall be permitted to get more than five cars in advance of another run or entry, and in pick mines not more than two cars, except in case of accident.

Sec. 32. It is further agreed that the operators shall offer no objection to the check-off for the check-weighman, and for dues for the U. M. W. of A., provided that no check-off shall be made against any person until he shall have first given his consent in writing to his employer. This applies to all day work as well as miners.

ARTICLE IX.

Section 1. It is agreed that when miners come out or stay out of the mine for the purpose of redressing a grievance, real or supposed, thus entirely or partially shutting down mine or mines contrary to the expressed terms of the agreement, each employe so ceasing or refraining from work shall be fined in the sum of one dollar per day during such shut-down. The total amount so collected, together with an equal amount to be paid by the Company, shall be deposited at the First National Bank of Terre Haute, where it shall be held subject to check by the Treasurer of Operators' Association and the Treasurer of District No. 11, U. M. W. of A, jointly, until such time as the case has been definitely settled.

After the decision has been rendered and it is found that the shut-down was in violation of the contract, the fines collected from the miners and held in deposit shall be turned over to the Operators' Association, but if not guilty of violation of contract the money shall be returned to the miners from whom collected, and if it has been proven that the cause leading to the shut-down was a violation, on the part of the mine management, of the expressed terms of the contract with the exception of Section 31, Article 8, the amount paid by the Company and held in deposit shall be turned over to District No. 11, U. M. W. of A., but if there was no such violation of the contract on the part of the mine management, the amount paid by the Company shall be refunded.

Sec. 2. Any mine manager, superintendent or mine boss who shall fail to comply with the expressed provisions of this contract shall be fined $5.00 for the first offense and for each and every subsequent offense. It is understood and agreed that the penalty imposed in this paragraph shall not apply to Section 31, Article 8, or to violation of local rules that have not been agreed to by mine manager and mine committee and reduced to writing and forwarded to the Secretary of the Operators and President of District 11. The fine thus assessed shall be deducted from each person so offending through the pay roll, and this agreement is the Company's authority for making such deductions.

Sec. 3. It is agreed, that when any employe shows that he spoke against, or was not present when a suspension of work was ordered, or took place, the fine shall be refunded to such employe furnishing such evidence and an equal amount shall be refunded to the Company out of the amount deposited.

Sec. 4. It is agreed that in the event of an inside employe being wrongfully discharged, and it is so discovered by methods herein provided, and by the same methods is reinstated, he shall be paid for time lost at the rate per day prevailing for inside day labor: Provided, however, that the company shall have the option of permitting the accused to continue at work pending the investigation, and the same shall apply to outside day laborers, except the outside day labor scale shall be paid.

Sec. 5. Except in cases of fatal accidents in the mine the mine shall in no case be thrown idle because of any death or funeral; in the event of a fatal accident in the mine, the employes may discontinue work for the remainder of the day, but work at the option of the operator shall be resumed the day following and continue thereafter. Nothing herein shall be construed to prevent an employe from absenting himself from work to attend the funeral of a fellow employe or member of his family.

Sec. 6. In consideration of the observances of the above rule, and the enforcement of same, it is agreed that the following schedule of death benefits shall be paid to all parties entitled to receive the same: For a man, $50.00; for an employe's wife, $50.00; for any member of the family over the age of fourteen years, excepting married children, $35.00, the company to pay one-half of the above amounts and the local union the remainder: Provided, however, that in the event of the mine being thrown idle on the day of any funeral by reason of an insufficient number of men reporting for work then the company shall not be expected to pay any part of the amounts herein named.

AGREEMENT OF ROLL COMMITTEE.

The undersigned having been appointed with authority of the Joint Convention, May 29, 1908, to adopt a uniform method for the payment of rolls, which report was to become a part of the contract then adopted, agree:

1st. That the following conditions and rules govern the payment for rolls in the Bituminous Mines in the State of Indiana.

2nd. That rolls in top or bottom coming up or down not to exceed six inches are not considered in this agreement, but when coming up or down from bottom or roof to exceed six inches, and it is not necessary to remove the same, the miner shall not be required to do so only for the width of the roadway.

3rd. That all rolls shall be paid for by cubical contents to be measured on each rib, measurement to be from point where coal quits to a point where coal begins, and at right angles with roll, and in such way as to ascertain average thickness.

4th. All material from rolls shall be removed by the miner. In narrow places where gobbing the dirt is impracticable, he shall load it in cars. In wider places where there is room to gob such material and the Company requires it gobbed, the miner shall do so: Provided, however, that he shall not be required to handle any such material more than once. Such material shall be removed at a sufficient distance from the face to allow the machine to operate unimpeded.

5th. All men working in roll shall have at least an equal turn of cars with the others on the run. This applies to the regular coal cars.

6th. The miner shall make height for the roadway, the height of the vein of coal when required to do so.

7th. The prices to be paid per cubic foot of roll, for chain machine, rolls 3 feet and over 2.6 cents per cubic foot; rolls 18 inches to 3 feet, 3.7 cents per cubic foot; rolls from 0 to 18 inches, 4.2 cents per cubic foot. For punching machines, rolls 3 feet and over, 2.8 cents; rolls 18 inches to 3 feet, 3.9 cents, and rolls 0 to 18 inches, 4½ cents per cubic foot. Pick mining, rolls 3 feet and over, 3.4 cents per cubic foot; rolls 0 to 18 inches, 5½ cents per cubic foot.

8th. These prices include the machine runner and loader, and shall be divided in the same proportion as regular work.

9th. The above scale does not apply to rolls that are so hard that they cannot be drilled with regular drilling machine. The thread bar to have not more than eight threads to the inch.

10th. Any dispute arising under this addition to our contract which cannot be settled by the means therein provided, shall be referred to this committee for settlement.

Indiana Bituminous Coal Operators' Association:

P. H. PENNA,
JOHN HEWITT,
Committee.

District No. 11, U. M. W. of A.:

W. D. VANHORN,
CHAS. FOX,
Committee.

AGREEMENTS.

Between the Block Coal Operators and the United Mine Workers of America, District No. 8, from April 1, 1910, to April 1, 1912.

BRAZIL BLOCK AGREEMENT.

1. Entered into this 12th day of April, 1910, between the Operators' Scale Committee of the Brazil Block Coal District and the Executive Board of the United Mine Workers of America, representing District No. 8.

Pick Scale and Yardage.

2. The price for mining screened block coal in the Block Coal District of Indiana shall be $1.05 per ton of two thousand pounds, it being understood also that the price for digging unscreened coal shall be an equivalent of the price paid for screened coal.

3. Further details in the scale price for pick mining in the Block Coal District shall be as follows:

4. The payment for low coal shall be upon the following scale:

5. For all coal two feet ten inches and under three feet one inch, $1.10 per ton.

6. For all coal under two feet ten inches, $1.15 per ton.

7. The price of yardage shall be as follows:

Single yardage for coal 3 ft. 1 in. and over	$1.05
Double yardage for coal 3 ft. 1 in. and over	2.10
Gob entries in coal 3 ft. 1 in. and over	1.57½
Gob entries in coal 3 ft. 1 in. and over without brushing	.52½
Single yardage for coal 2 ft. 10 in. and under 3 ft. 1 in	1.10
Double yardage for coal 2 ft. 10 in. and under 3 ft. 1 in	2.20
Gob entries in coal 2 ft. 10 in. and under 3 ft. 1 in.	1.65
Gob entries in coal 2 ft. 10 in. and under 3 ft. 1 in. without brushing	.55
Single yardage in coal below 2 ft. 10 in	1.15
Double yardage in coal below 2 ft. 10 in.	2.31
Gob entries in coal below 2 ft. 10 in.	1.75
Gob entries in coal below 2 ft. 10 in. without brushing	.58

All entries to be driven when required by the operator 5½ feet in the clear in height (and the miners agree to gob the dirt when they are not required to take it more than the distance of six rooms back from the last breakthrough, and when the dirt is hauled by a mule, then the miners agree to unload same at a distance of not more than eight rooms back from the last breakthrough from the face of the entry). This agreement shall apply to all the block coal mines in the Block Coal District, with the exception of the present No. 2 Superior Mine of the Zeller-McClellan Company, and in this mine the same conditions continue as were in force during the years just ending, viz.: The miners shall continue to gob the breakthroughs. 26 cents per yard shall be paid extra for all double yardage when the same is worked double shift, and 13 cents per yard for all single yardage when the same is worked double shift. Work on driving entries and drawing pillars may be by double shift at the option of the operator.

Day Men's Scale.

8. Inside day scale.

Track Layers	$2.70
Trappers	1.19
Bottom Cagers	2.70
Drivers	2.70
Trip Riders	2.70
Water Haulers	2.70
Timbermen, where such are employed	2.70
All other inside day labor	2.70
Blacksmiths	2.99
All other outside day labor	2.12½

9. The firemen and night pumpers shall be paid at the rate of 26½ cents per hour for their labor. The above wage is based on an eight hour work day, but in the event the operator desires it, the firemen and night pumpmen are to work overtime to the extent of not more than two hours in any one day or shift. However, it is understood that in the event of an emergency the firemen and night pumpers will not limit their time, but continue work till such emergency is past.

10. The firemen and night pumpers shall be subject to the same rules and regulations as top men, and be in their class, and may be laid off in case the mine shall work parts of days, and the work of firemen and top men shall be interchanged if it is found to be in the interest of the employer so to do. For example: Where work can be performed by one man, the firing and any other work about the top shall be done by any one of the top men selected.

11. When the miner is working a deficient place and is being paid by the day, his pay shall be $2.70 per day, and if he uses his own tools during such time he shall be paid 10 cents per day for the use of the same. The operator shall have the option of furnishing the tools for such work.

12. The price of blacksmithing shall be 11½ cents on the dollar.

13. The semi-monthly pay shall continue until the constitutionality of the law providing for weekly pays shall have been passed upon by the Supreme Court of Indiana and of the United States.

14. The operators agree to keep the bottom within six feet of the face at starting time and in no case shall exceed nine feet.

15. Inside day work may be done upon idle days, and in case of emergency, on overtime.

16. The miners agree to go to the magazine and get their powder as heretofore, take said powder to the top of the mine and place his number thereon. The operators agree to take charge of the powder and place it on the double parting below. It will then be delivered to the miners as heretofore. The Company will not be held responsible for the same.

Hours of Work.

17. The hour of beginning work in the morning shall be 7 a. m., with thirty minutes stop for dinner, and begin shooting at 3:30 p. m. from April 1st to October 1st of each year, and from October 1st to April 1st of each year the mines shall start at 7:30 a. m., with thirty minutes stop for din-

ner, and begin shooting at 4 p. m., and no shooting shall be done at any other time except by mutual consent between the bank boss and the bank committee, and in the event that the mine is to work half a day only, it shall be the duty of the mine boss to notify the mine committee of the fact.

The Officers and Miners' Board of District 8 hereby agree and pledge themselves to see that the men in the mines carry out the contract by working eight hours per day; and that they will put into effect and maintain rules which will compel the men to be at their working places on time and remain at work until the expiration of eight hours.

18. Eight hours a day means eight hours work in the mine at the usual working places for all classes of inside men. This shall be exclusive of the time required in reaching such working places in the morning and departing from the same at night.

19. The miners hereby agree to do all the propping in their rooms except setting the props required to break the bottom in shooting the same and if any props are loosened or displaced, thereby endangering the safety of the workmen, the miners agree to reset the same.

Setting Long Props.

20. The miners working at Zeller & McClellan's No. 4 mine and the Indiana Block Coal Company's mine at Saline, shall set all the props in their rooms and shall set all the props along the roadway. When bottom is blasted for the roads and long props are made necessary along the roadway, the miners agree to set them. And the operators agree to pay therefor 3 cents each for all long props so set by them. The companies above named shall provide the props of required length.

21. It is also agreed on the part of the operators not to require the miners to put down their own road, and bottom shooters may lay the road in the rooms when required.

22. The operators agree to give each miner as near as possible an equal turn of cars for coal, and not to allow any day hands to load coal on idle days, but in no case shall a turn apply to the handling of dirt, except in entries, unless otherwise specified in our agreement, but the operators agree to put in the mines a sufficient number of mules to remove all the coal and dirt therefrom. It is agreed that nothing herein shall conflict with the gobbing of dirt as hereinbefore provided. The operators will give an equal turn of work to all inside day men as near as practicable, who are competent, excepting tracklayers and timbermen, adjustment of turns to be semi-monthly.

23. No miner shall be discharged or discriminated against because of his refusal to do work by the day when called upon by the pit boss. If, by the absence or refusal to work of any day man, or men, work is likely to be interfered with, the mine committee, when called upon, shall assist the mine boss to furnish competent men in case he fails to secure them at the scale rate, so that the mine shall continue work.

24. It is also agreed not to require miners to load or clean falls unless they are caused by some fault of the miner not properly timbering his working place, or his having shot or caused his timber to become insecure, in which case it will be the duty of the miner to put his place in good order again.

25. Should the mine boss or superintendent at any time discharge a miner or mine laborer and upon investigation by the mine committee they believe there were not good and sufficient causes for so doing, they shall at once notify such boss or superintendent of their decision, and pending the matter being decided upon by the final board as provided in such cases, the management may at their option retain in their employ such person so discharged pending the final dicision. If said board finds that the man was discharged without sufficient cause he shall be reinstated, and shall be paid his regular wage for all time lost by such discharge, but days which the mine was not in operation during this period shall not be reckoned as lost.

Settlement of Differences.

26. It is further agreed that if any differences arise between the operators and miners at any pit, settlement shall be arrived at without any stopping of work. If the parties immediately affected cannot reach an adjustment between themselves, the question shall be referred to the Executive Board of the United Mine Workers of America representing District No. 8, and an equal number of operators, whose action shall be final, but no operator or miner interested in the differences shall be a member of said committee. The Officers' and Miners' Board of District No. 8, United Mine Workers of America, hereby agree and pledge themselves to put into effect at the different Locals of the district certain rules and regulations requiring men to be fined one dollar per day for the violation of the above clause, said fine to be checked off by the operators and turned over to District No. 8. On failure of said officers and board to accomplish their agreement to see that this part of the contract is observed, the following clause shall become effective, and from that time on it shall be binding and have full force and be a part of the contract, viz.: It is understood and agreed that when any of the workmen in and about a mine stop the same for the purpose of redressing a grievance, real or supposed, thus shutting the mine down contrary to this agreement, each employe shall pay to the owner of said mine the sum of $1.00 per day during such shut down. The payment shall be deducted from each person through the pay roll and this agreement is authority for making such deduction. It is further agreed that no coal company, because of any grievance with any employe, real or supposed, shall stop the mine, and any company so shutting down its mine shall pay to each workman in and about the mine $1.00 per day during such shut down.

27. The duties of the mine committee shall be confined to the adjustment of disputes between the mine boss or superintendent and any member of the United Mine Workers of America working in and around the mines, excepting the engineer working at such mine. In no case shall the mine committee have power to send day men home when needed by the operator, but the mine committee may bring any grievance before the joint board through their district officials.

Drivers' Rules.

28. Regarding Drivers: They shall take their mules to and from the stables and the time required in so doing shall not include any part of the day's labor, their work beginning when they reach the parting at which

they receive empty cars, and in no case shall the driver's time be docked while he is waiting for such cars at the point named, but when the men go into the mine in the morning they shall be entitled to two hours' pay whether or not the mine works the full two hours, and after the first two hours the men shall be paid for every hour thereafter by the hour, or for each hour's work or fractional part thereof. If for any reason the regular routine of work cannot be furnished inside labor for a portion of the first two hours, the operators may furnish other than the regular labor for the unexpired time.

29. But under no circumstances will the operators recognize or treat with the mine committee or any representative of the United Mine Workers of America during the suspension of work contrary to this agreement.

30. The Block Coal District of Indiana may continue the use of the diamond bar screen, the screens to be 72 feet superficial area, of uniform size, 1¼ inches between the bars, free from obstructions, and that such screen shall rest upon a sufficient number of bearings to hold the bars in proper position.

31. It is hereby further agreed that track layers may begin work on top before the usual time for hoisting coal in getting the track material ready to send down on the cage, and that the time required in doing so shall be a part of the eight hours' work.

32. In case of emergency work the mine boss shall consult with the mine committee, and if they approve of the work being done on overtime the men engaged thereon shall not be required to lay off until their time is equalized with the others working in such mine.

33. The Crawford Coal Company, in their mines at Center Point, may continue to do the brushing in the entries where the coal is three feet one inch and under in thickness.

34. The wages of the blacksmiths shall be $2.99 per day at all of the mines, and in addition to his ordinary duties he shall do any other labor, and shall work at any mine owned by the company when required of him by the mine management, provided that he shall receive his regular wages therefor.

35. All Local rules regarding the number of cars required above the tipple to be abolished.

36. In the event of death by accident in the mine, the miners shall have the privilege of discontinuing work for the remainder of that day, but at the option of the operators work shall be resumed on the following day.

37. The miners shall not stop work on the day of a funeral where death is the result of an accident in the mine, or otherwise, but instead men may absent themselves from work for the purpose of attending the funeral, and except in case of fatal accidents as above, the mine shall not in any case be thrown idle because of any death or funeral.

Funeral Benefits.

38. In consideration of the enforcement of this agreement, referring to funerals of employes only, of any particular mine, and not otherwise, it is mutually agreed that an assessment of 3 cents per month shall be deducted on the payrolls from each employe of District No. 8, members of the United

Mine Workers of America. Said deduction, when made, shall be turned over to the Secretary-Treasurer of District No. 8, together with an equal sum to be paid to the operators of said district. Said fund shall be deposited in the Citizens National Bank, Brazil, Indiana. On the death of an employe only the sum of $50.00 shall be paid from said fund to the family of the deceased or to the legal representative thereof. Said payments shall be made by checks only, and said checks shall be countersigned by the Operators' Commissioner of District No. 8. In the event that the above named assessment of 3 cents per man per month is insufficient to pay $50.00 to each party entitled thereto, an increase in such assessment shall be made by the joint board of miners and operators convened for that purpose. Also, should the assessment prove to accumulate a fund greater than is necessary to pay the funeral benefits required, the assessment shall be suspended for a time till the fund is reduced to the sum of $100.00, or two funeral benefits.

Hoisting Engineers' Scale.

39. On and after April 1, 1910, until April 1, 1912, the scale of hoisting engineers throughout the Block Coal District, or District No. 8, shall be as follows: Where one engineer is employed the compensation shall be eighty-eight dollars and fifty-eight cents ($88.58) per month, and where two engineers are required the first engineer shall receive eighty-eight dollars and fifty-eight cents ($88.58) per month, the second seventy-six dollars and seventy-seven cents ($76.77) per month, and when they change week about, eighty-two dollars and sixty-eight cents ($82.68) per month.

40. It is agreed on the part of the engineers to be at their work in time to lower the men and mules, and remain a sufficient length of time after the regular working hour to hoist the men and mules from the mine. Also to keep up all repairs on the machinery, including pumps in the mine.

41. It is mutually agreed that a licensed engineer shall be employed at all times when steam is required at the throttle. Provided, however, that in all cases where the mine is not hoisting coal, or the machines are not operated, then, in all such cases, the engineers are required to do their own firing, it being understood that this provision does not apply to any case where the work of the mine may be stopped in the midst of any one shift. Nor does it cover any case where the fireman is required to assist in the washing or cleaning out of the boilers on Sunday.

42. It is fully understood and agreed upon the part of the United Mine Workers of America that the engineers will not under any circumstances allow affiliation with any labor organization to interfere with or prevent their being on duty at any and all times required by the operators, and that they will not suspend work in sympathy with any organization, and, further, that they will, during the continuance of this contract, at all times fully protect all the company's property under their care, and that they will operate fans and pumps, and lower and hoist such men or supplies as may be required to protect the company's property and any and all coal that may be required to keep up the steam at the company's plant. But it is understood that the operators will not ask them during this period to hoist any coal produced by non-union labor for sale on the market.

43. No engineer shall lay off or exchange shifts without the consent of the operators

44. It is also agreed that in case of sickness or unexpected absence of the engineer, any other engineer or engineers shall perform his duty; and if desired by them his wages for time so absent shall revert to the engineer performing such duty.

45. It is further agreed no hoisting engineer shall be subject to the interference or dictation of the mine committee, nor the local unions, but all differences between the engineer and his employer shall be adjusted by the officers of the United Mine Workers of America and employer interested.

46. It is also agreed upon the part of the operators that they will enforce a rule forbidding the entering of the engine room by loafers and disinterested parties, and that they will have cards printed and placed in conspicuous places to this effect.

47. This contract is entered into in good faith by both parties and there is to be no deviation from it by the operators, miners, laborers, or any local union.

Committee on Behalf of the Operators for the Block Coal District:

JOHN CHESTERFIELD, JR.
JAS. H. MCCLELLAND,
WILLIAM M. ZELLER,
WILLIAM E. EPPERT,
W. W. RISHER,
W. PAUL ZIMMERMANN.
C. EDW. HOFFMAN,
H. W. JENKINS.

Executive Committee District No. 8, United Mine Workers of America, for Block Coal Mines:

GEORGE MORGENTHALER,
W. T. HILL,
JAMES D. HOLDEN,
JAMES FOSTER,
THOMAS SAVANT.

MACHINE MINING SCALE.

1. Contract between the Machine Operators of the Block Coal District and the Executive Board of District No. 8, United Mine Workers of America, governing prices and conditions of mining in machine mines, Block Coal District.

2. Entered into this 12th day of April, 1910, and continuing until April 1, 1912, between the Operators of Machine Mines of the Block Coal District and the Executive Board of the United Mine Workers of America, representing District No. 8.

3. The price for loading, shooting, timbering, taking care of all draw slate that is four (4) inches and under in thickness, in rooms and entries shall be fifty-seven and one-half (57½) cents per ton.

4. Price for entry driving, 6 to 9 feet wide, fifty-six (56) cents per yard.

5. Price for entry driving, 9 to 12 feet wide, thirty-four (34) cents per yard.

6. All loaders agree to keep the bug dust and draw slate back 14 feet from the working face.

7. All entries more than twelve (12) feet in width shall be paid same as rooms, except where entries are driven more than twelve (12) feet wide, a road shall be placed in the center, or when the road is placed on the rib the same shall be paid as gob entry.

8. Machine runners and helpers to be paid twenty-five (25) cents per ton and when working by the day, machine runners to be paid $3.20 per day, helpers $2.85, motormen, $3.20.

9. Entry driving, 6 to 9 feet wide, machine runner to be paid 26 cents per yard.

10. Entry driving, 9 to 12 feet wide, machine runner to be paid 17 cents per yard.

11. It is further agreed that where there is not sufficient room to gob the bug dust and draw slate, the loader will load it in the bank cars and the company will unload it. The operators agree to keep all bottom in rooms 4 feet from the face at starting time and in no case shall it exceed 6 feet.

12. It is understood that there shall be nothing paid for room turning or low coal and there shall be nothing charged for blacksmithing.

13. There shall be no discrimination against any employe.

That the system of loading coal in machine mines be on the following basis, to wit:

1. That one man shall have the right to two places where he can take care of the same.

2. That two men shall have the right to three places where they can take care of the same.

3. All others one place.

4. When a man is off work for more than one day the mine boss shall have a right to put a man in the places if it is necessary, providing the man leaves the places in the same condition as near as possible as he found them.

5. The Block Coal District of Indiana may continue the use of the Diamond bar screen, the screen to be seventy-two (72) feet superficial area, of uniform size, one and one-quarter (1¼) inches between the bars, free from obstructions, and that such screen shall rest upon a sufficient number of bearings to hold the bars in proper position.

6. This agreement to become a part of the agreement entered into the 12th day of April, 1910, between the Operators' Scale Committee of the Block Coal District and the Executive Board of the United Mine Workers of America, representing District No. 8.

On behalf of the Machine Operators of the Block Coal District:

JOHN CHESTERFIELD, JR.
WILLIAM E. EPPERT,
E. EDW. HOFFMAN.

On behalf of the Executive Board District No. 8, United Mine Workers of America:

GEORGE MORGANTHALER,
W. T. HILL,
JAMES D. HOLDEN,
JAMES FOSTER,
THOMAS SAVANT.

TABLE

Showing by Counties the Name of Mine, Number of Tons of Screened, Slack, Nut and Mine Run Coal, Total Tons of all Grades of Coal Produced and the Distribution Thereof, the Production of Block and Bituminous Coal, Each Being shown Separately, as is the Machine and Pick or Hand-Mined Coal.

BLOCK COAL MACHINE MINES.

PARKE COUNTY.

NAME OF MINE.	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Scr'ned Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Mary No. 1	7,237	844	.....	8,081	3,928	512	.....	4,440	1,106	11,415	$8,578 78	$3,710 16	$2,951 86	$15,240 80
Total	7,237	844	.....	8,081	3,928	512	.....	4,440	1,106	11,415	$8,578 78	$3,710 16	$2,951 86	$15,240 80

VIGO COUNTY.

Plymouth No. 1	50,934	12,953	.....	63,887	23,561	6,081	.....	29,642	32,397	61,132	$69,865 90	$31,281 10	$8,614 00	$109,761 00
Domestic block No. 1	46,257	11,647	.....	57,904	.....	.....	.....	.....	11,429	46,475	46,537 41	24,534 70	7,562 25	78,634 36
Mary No. 2	43,611	11,221	.....	54,832	11,435	4,292	.....	15,727	10,155	60,404	57,607 37	17,553 16	8,212 10	83,372 63
Total	140,802	35,821	.....	176,623	34,996	10,373	.....	45,369	53,981	168,011	$174,010 68	$73,368 96	$24,388 35	$271,767 99
Total machine mined block coal	148,039	36,665	.....	184,704	38,924	10,885	.....	49,809	55,087	179,426	$182,589 46	$77,079 12	$27,340 21	$287,008 79

BLOCK HAND OR PICK MINES.

CLAY COUNTY.

NAME OF MINE.	PICK MINED.				DISTRIBUTION.		WAGES PAID.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Brazil No. 1	1,261	250	.....	1,511	1,511	.....	$1,414 42	$1,107 00	$300 44	$2,821 86
Brazil No. 4	53,031	10,615	.....	63,646	31,823	31,823	60,863 78	28,671 65	10,459 90	99,995 33
Superior No. 4	24,385	6,250	1,171	31,806	15,553	16,253	31,151 89	21,213 79	9,938 10	62,303 78
Crawford No. 2	12,102	2,391	844	15,337	5,119	10,218	13,590 78	8,433 73	3,139 91	25,164 42
Crawford No. 6	25,718	4,382	1,767	31,867	8,268	23,599	35,645 74	11,786 55	4,939 90	52,372 19
Crawford No. 9	1,863	450	.....	2,313	2,313	.....	1,867 70	638 16	750 69	3,256 55
Crawford No. 10	60,888	15,801	430	77,119	23,140	53,979	73,371 51	22,693 41	6,906 63	102,971 55
Indiana Block No. 1	11,717	2,658	7,255	21,630	4,818	16,812	20,048 02	6,719 83	3,671 37	30,439 22
Plymouth No. 2	35,528	10,548	.....	46,076	23,038	23,038	410,093 15	13,207 36	5,032 05	59,332 56
Pyrah	Working less than ten men									
Monarch	.....	.....	5,749	5,749	5,749	.....	6,035 10	5,364 43	5,600 68	17,000 21
Eureka No. 5	46,701	10,336	.....	57,037	18,479	38,558	51,289 67	18,321 37	7,110 87	76,721 91
Treager	2,517	396	.....	2,913	2,913	.....	3,131 94	801 70	519 79	4,453 43
Harrison No. 5	Not reported									
Wizard	34,143	6,316	93	40,552	20,276	20,276	40,870 59	11,722 07	3,751 00	56,343 66
Progressive	3,397	.....	427	3,824	3,824	.....	2,419 57	3,680 12	1,045 98	7,145 67
Schefferman	Not reported									
Crawford No. 11	3,405	844	.....	4,249	4,249	.....	5,948 83	3,938 82	1,654 03	11,541 68
Bee Ridge	Not reported									
German	Not reported									
Total	316,656	71,237	17,736	405,629	171,073	234,556	$388,742 69	$158,299 99	$64,821 34	$611,864 02

PARKE COUNTY.

Brazil Block No. 9	31,168	6,300	.....	37,468	8,812	28,656	$36,842 35	$15,475 44	$7,359 82	$59,677.61
Brazil Block No. 12	3,634	725	.....	4,359	1,446	2,913	3,804 90	1,091 98	748 14	5,645 02
Superior No. 2	36,056	8,825	4,832	49,713	.....	49,713	43,702 96	17,444 08	9,090 95	70,237 99
Superior No. 3	48,650	12,350	.....	61,000	30,500	30,500	56,429 73	16,008 12	8,254 61	80,692 46
Superior No. 5	66,477	16,300	.....	82,777	.....	82,777	72,265 11	11,202 79	10,600 81	94,068 71
Moore	Idle.	.....	.....	.....	.....	.....	.....	.....	.....	.....
S. B.	Idle.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	185,985	44,500	4,832	235,317	40,758	194,559	$213,045 05	$61,222 41	$36,054 33	$310,321 79
Total hand mined block coal	502,641	115,737	22,568	640,946	211,831	429,115	$601,787 74	$219,522 40	$100,875 67	$922,185 81
Total machine mined block coal	186,963	47,550	.....	234,513	55,087	179,426	$182,589 46	$77,079 12	$27,340 21	$287,008 79
Total block coal	689,604	163,287	22,568	875,459	266,918	608,541	$784,377 20	$296,601 52	$128,215 88	$1,209,194 60

BITUMINOUS HAND OR PICK MINES.

CLAY COUNTY.

NAME OF MINE.	Pick Mines.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Klondyke No. 3	30,566	20,157	69,265	119,988	110,000	9,988	$79,271 28	$16,892 08	$8,021 89	$104,185 25
Vivian No. 1	Idle.									
Gifford No. 2	22,280	8,256	78	30,614	15,308	15,306	22,483 88	4,784 20	3,005 03	30,373 11
Total	52,846	28,413	69,343	150,602	125,308	25,294	$101,755 16	$21,676 28	$11,026 92	$134,458 36

DAVIESS COUNTY.

Winklepeck	Working less than ten men									
Montgomery No. 4	13,573	5,350	13,434	32,357	25,279	7,078	$23,143 99	$4,101 70	$3,649 15	$30,894 84
Winterbottom No. 3			4,945	4,945	4,945		3,032 29	1,007 83	1,020 23	5,060 35
Mutual	13,630	2,570	19,190	35,390	21,185	14,205	31,715 00	1,744 00	1,572 00	35,031 00
Mandabach	Not reported									
Pine Island No. 1	Working less than ten men									
Total	27,203	7,920	37,569	72,692	51,409	21,283	$57,891 28	$6,853 53	$6,241 38	$70,986 19

FOUNTAIN COUNTY.

Indio	Idle.									
Total										

GREENE COUNTY.

Dickason	31,463	13,799	7,869	53,131	37,459	15,672	$34,128 45	$8,920 12	$4,957 37	$48,005 94
Sponsler	24,554	12,060	34,597	71,211	49,935	21,276	42,416 27	14,854 67	5,605 79	62,876 73
Antioch	Idle.									
North Linton	Idle.									
Vandalia No. 3	Idle.									
Vandalia No. 4	56,962	24,584	98,859	180,405	168,388	12,017	116,531 74	26,908 03	8,238 69	151,678 46
Queen	2,030	2,030	109,231	113,291	68,524	44,767	70,310 56	11,454 74	7,381 25	89,146 55
Cherry Hill	13,885	9,933	6,865	30,683	18,287	12,396	18,977 00	2,677 35	2,343 73	23,998 08
Letsinger	21,950	11,603	47,713	81,266		81,266	58,745 08	4,827 16	7,330 84	70,903 08
Monarch	Idle.									
Enterprise			5,772	5,772	5,772		2,300 00	849 30	625 00	3,774 30
Total	150,844	74,009	310,906	535,759	348,365	187,394	$343,409 10	$70,491 37	$36,482 67	$450,383 14

GIBSON COUNTY.

Oswald	69,044	79,328	76,486	224,858	224,858		$133,237 09	$38,811 82	$23,786 93	$195,835 84
Fort Branch	13,524	11,503	14,648	39,675	27,975	11,700	25,460 16	8,814 27	6,292 32	40,566 75
Francisco			20,568	20,568		20,568	14,972 68	2,491 74	1,419 60	18,884 02
Total	82,568	90,831	111,702	285,101	252,833	32,268	$173,669 93	$50,117 83	$31,498 85	$255,286 61

KNOX COUNTY.

Wheatland			62,421	62,421	62,421		$33,891 65	$7,583 11	$4,760 37	$46,235 13
Total			62,421	62,421	62,421		$33,891 65	$7,583 11	$4,760 37	$46,235 13

PARKE COUNTY.

Vandalia No. 316	16,632	10,302	4,721	31,655	26,939	4,716	$21,323 56	$9,351 37	$2,347 49	$33,022 42
Fairview	45,401	42,317	29,192	116,910	52,392	64,518	86,782 99	25,069 23	9,256 67	121,108 89
Total	62,033	52,619	33,913	148,565	79,331	69,234	108,106 55	34,420 60	11,604 16	154,131 31

PERRY COUNTY.

NAME OF MINE.	Pick Mines.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Lincoln	Idle.									
Total										

PIKE COUNTY.

Ayrshire No. 4	76,614	71,044	46,910	194,568	66,488	128,080	$118,712 94	$28,097 28	$11,948 77	$158,758 99
Muren	Idle.									
Blackburn No. 1			43,341	43,341	43,341		263,95 15	8,065 39	3,460 69	37,921 23
Blackburn No. 2	11,874	12,235	34,574	58,683	33,797	24,886	34,576 82	9,879 33	5,632 59	50,088 74
Littles	40,042	64,152	29,124	133,318	40,873	92,445	78,302 13	24,440 18	8,024 42	110,766 73
Winslow No. 4 and 5										
Hartwell No. 1	Idle.									
Hartwell No. 2	Idle.									
Hartwell No. 3	Idle.									
Total	128,530	147,431	153,949	429,910	184,499	245,411	$257,987 04	$70,482 18	$29,066 47	$357,535 69

SULLIVAN COUNTY.

Superior	9,370	7,603	5,093	22,066		22,066	$11,931 25	$5,108 57	$2,618 66	$19,658 48
Con. No. 32	106,199	51,399	43,382	200,980		200,980	123,954 29	39,490 23	12,300 33	175,744 85
Citizens	3,674	1,618	4,110	9,402	9,402		6,452 04	1,910 03	1,648 62	10,010 69
Keystone	36,922	32,276	10,656	79,854	37,039	42,815	52,021 60	18,489 45	7,621 41	78,132 46
Viola	29,837	25,167	18,284	73,288	23,283	50,005	47,745 67	16,316 71	7,241 41	71,303 79
Freeman	33,587	16,765	11,731	62,083	14,123	47,960	41,529 61	14,896 52	7,331 74	63,757 87
Hudson	Idle.									
Bellevue			46,244	46,244	46,244		28,614 29	8,119 35	6,803 22	43,536 86
Larsh	Less than	ten men								
Hamilton	3,687	2,792	431	6,910		6,910	6,022 16	4,054 72	3,414 95	13,491 83
Total	223,276	137,620	139,931	500,827	130,091	370,736	$318,270 91	$108,385 58	$48,980 34	$475,636 83

VANDERBURGH COUNTY.

Diamond	20,664	11,533	4,941	37,138	37,138	.....	$25,410 77	$5,521 38	$4,430 77	$35,362 92
Ingleside	4,591	12,623	34,291	51,505	.....	51,505	28,280 93	14,970 18	4,496 84	47,747 95
Sunnyside	26,113	60,690	7,418	94,221	77,974	16,247	29,210 00	7,290 00	7,183 00	43,683 00
Unity	35,085	27,867	78,275	141,227	.....	141,227	86,946 71	25,848 48	10,524 90	123,320 09
First Avenue	25,062	14,646	6,188	45,896	45,896	.....	30,312 00	9,674 41	5,434 11	145,420 52
Total	111,515	127,359	131,113	369,987	161,008	208,979	$200,160 41	$63,304 45	$32,069 62	$295,534 48

VERMILLION COUNTY.

Dering No. 8	101,283	86,945	87,915	276,143	.....	276,143	$147,828 90	$70,162 42	$9,551 45	$227,542 77
Eureka	.....	.....	2,763	2,763	2,763	.....	1,718 00	554 45	347 31	2,619 76
Crown Hill No. 1	63,683	25,093	180,465	269,241	66,486	202,755	175,991 37	54,494 10	9,205 92	239,691 39
Crown Hill No. 2	48,985	16,526	179,022	244,533	48,474	196,059	166,646 12	35,240 77	6,794 91	208,681 80
Maple Valley	13,758	9,050	14,976	37,784	.....	37,784	26,578 00	5,618 85	2,629 60	34,826 45
Buckeye No. 2	49,620	39,240	148,014	236,874	.....	236,874	144,113 19	50,106 25	9,548 25	203,767 69
Klondyke	43,210	33,319	190,099	266,628	.....	266,628	166,571 84	27,041 35	10,108 05	203,721 24
Total	320,539	210,173	803,254	1,333,966	117,723	1,216,243	$829,447 42	$243,218 19	$48,185 49	$1,120,851 10

VIGO COUNTY.

Vandalia No. 66	72,157	56,274	7,241	135,672	107,068	28,604	$77,121 78	$30,800 32	$8,401 58	$116,323 68
Vandalia No. 67	75,235	36,872	114,480	226,587	118,356	108,231	147,990 50	39,239 51	12,447 26	$99,677 27
Vandalia No. 81	35,579	27,870	3,174	66,623	37,978	28,645	39,864 15	17,067 23	7,739 80	64,671 18
Forrest	62,458	64,365	89,874	216,697	.....	216,697	144,387 96	52,968 43	17,117 26	214,473 65
Atherton	.....	.....	129,492	129,492	.....	129,492	79,879 05	41,082 80	9,827 09	130,788 94
Riverside	6,185	2,647	84,818	93,650	55,175	38,475	63,543 00	14,290 35	6,596 50	84,429 85
Lower Vein No. 1	87,066	57,307	48,058	192,431	192,431	.....	109,167 46	34,055 13	9,518 75	152,741 34
Miami No. 2	2,210	1,729	21,134	25,073	.....	25,073	15,211 75	5,724 41	2,089 25	23,025 41
Miami No. 4	71,452	183,810	46,895	302,157	.....	302,157	189,659 60	57,448 98	10,686 61	257,795 19
Miami No. 5	27,556	20,443	34,028	82,027	.....	82,027	53,989 50	19,239 92	8,787 68	82,017 10
Miami No. 6	.....	.....	73,331	73,331	.....	73,331	53,662 01	16,364 57	9,175 48	79,202 06
Fauvre No. 2	25,075	21,689	21,758	68,522	31,210	37,312	37,478 75	9,252 92	4,099 80	50,831 47
Deep Vein No. 5	Not working	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ray No. 2	91,313	45,374	104,499	241,186	94,564	146,622	162,539 46	42,267 37	8,751 79	213,558 62
Sugar Valley	28,050	14,869	16,536	59,455	59,455	.....	39,181 31	7,222 92	5,050 01	51,454 24
Dering No. 6	48,763	23,160	212,473	284,396	.....	284,396	168,111 63	59,851 93	8,103 42	236,066 98
National	16,284	7,606	19,960	43,850	43,850	.....	26,802 77	12,981 20	6,174 31	45,958 28
Pittsburg No. 1	88,162	62,169	85,474	235,805	94,768	141,037	149,806 30	40,705 07	9,099 11	199,610 48
Total	737,545	626,184	1,113,225	2,476,954	834,855	1,642,099	$1,558,396 98	$500,563 06	$143,665 70	$2,202,625 74

WARRICK COUNTY.

NAME OF MINE.	Pick Mines.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
De Forrest	3,010	1,500	19,540	24,050	24,050	.....	$13,703 78	$4,180 54	$1,766 09	$19,650 41
Brizius	6,427	4,185	7,889	18,501	18,501	.....	10,556 01	3,828 87	3,051 44	17,436 32
Elberfeld	3,460	677	41,977	46,114	20,477	25,637	31,393 81	6,767 21	3,997 95	42,158 97
Epworth	Working	less than te	n men	.....	.....	.....	.....	.....	.....	.....
Korff	.....	.....	43,685	43,685	43,685	.....	25,308 14	2,776 77	1,789 54	29,874 45
Sargent	.....	.....	38,766	38,766	38,766	.....	22,484 65	2,979 17	1,561 06	27,024 88
Red Shaft	Working	less than te	n men	.....	.....	.....	.....	.....	.....	.....
Castle Garden	.....	.....	58,031	58,031	58,031	.....	41,681 86	45,735 90	5,142 50	92,560 26
Total	12,897	6,362	209,888	229,147	203,510	25,637	$145,128 25	$66,268 46	$17,308 58	$228,705 29
Total hand bituminous	1,909,796	1,508,921	3,177,214	6,595,931	2,551,353	4,044,578	$4,128,114 68	$1,243,364 64	$420,890 55	$5,792,369 87

BITUMINOUS MACHINE MINES.

CLAY COUNTY.

NAME OF MINE.	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Lewis	21,190	7,775	25,340	54,305	17,800	.....	9,722	27,522	29,404	52,423	$48,836 30	$19,197 69	$11,046 61	$79,080 60
Vivian No. 2	11,349	6,198	38,450	55,997	6,065	2,463	19,875	28,403	45,437	38,963	44,523 93	25,658 96	8,871 60	79,054 49
Island Valley No. 4	78,091	33,564	78,695	190,350	15,004	6,177	14,413	35,594	65,981	159,963	114,853 95	31,501 14	13,944 63	160,299 72
Total	110,630	47,537	142,485	300,652	38,869	8,640	44,010	91,519	140,822	251,349	$208,214 18	$76,357 79	$33,862 84	$318,434 81

GREENE COUNTY.

Black Creek	43,896	16,393	6,124	66,413	10,955	4,330	1,649	16,934	56,205	27,142	$44,804 61	$17,483 31	$7,124 59	$69,412 51
Vandalia No. 2	.....	.....	101,545	101,545	.....	.....	53,478	53,478	134,713	20,310	81,762 30	26,767 65	9,279 17	117,809 12
Vandalia No. 5	68,595	30,507	6,161	105,263	39,010	19,505	3,244	61,759	125,773	41,249	95,545 76	34,703 79	14,134 99	144,384 54
Vandalia No. 8	121,947	61,607	39,763	223,317	2,934	1,454	673	5,061	184,643	43,735	123,140 28	47,343 12	14,904 34	185,387 74
Vandalia No. 9	93,734	44,251	188,477	326,462	2,911	1,454	6,574	10,939	283,993	53,408	171,828 61	64,251 26	17,035 26	253,115 13
Vandalia No. 20	39,182	19,411	10,964	69,557	54,026	29,177	4,183	87,386	144,753	12,190	88,077 25	18,105 45	8,837 56	115,020 26
Vandalia No. 21	69,306	30,317	49,207	148,830	3,598	798	2,943	7,339	136,644	19,525	82,030 82	22,133 00	11,800 68	115,964 50
Gilmour	27,871	14,104	138,625	180,500	.....	.....	.....	.....	180,500	.....	95,971 08	46,861 72	15,882 13	158,714 93
Lattas Creek	113,935	22,809	180,193	316,937	.....	.....	.....	.....	.....	316,937	157,743 76	61,503 29	18,957 62	238,204 67
Summitt No. 2	51,797	59,356	104,784	215,937	.....	.....	.....	.....	215,937	.....	111,867 82	54,235 45	13,531 79	179,635 06
Green Valley	67,682	48,737	158,952	275,371	.....	.....	.....	.....	114,221	161,150	143,123 51	42,168 80	12,878 29	198,170 60
North West	43,033	26,323	61,493	130,849	7,505	4,226	12,367	24,098	154,947	.....	69,911 09	24,659 99	11,522 96	106,094 04
Twin No. 4	4,011	1,200	38,272	43,483	890	254	10,731	11,875	45,755	9,603	32,002 15	15,602 85	2,788 50	50,393 50
Twin No. 5	50,819	17,522	112,292	180,633	10,904	4,357	26,604	41,865	176,768	45,730	113,855 35	24,981 35	11,400 75	150,237 45
Total	795,808	392,537	1,196,852	2,385,197	132,733	65,555	122,446	320,734	1,954,952	750,979	$1,411,664 39	$500,801 03	$170,078 63	$2,082,544 05

KNOX COUNTY.

NAME OF MINE.	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Knox	40,570	22,576	119,963	183,109	2,080	1,147	7,896	11,123	73,145	121,087	$92,984 62	$32,473 44	$14,241 25	$139,699 31
Lynn	5,965	2,533	37,466	45,964	5,120	2,855	41,471	49,446	67,024	28,386	49,682 88	22,290 68	8,057 28	80,030 84
Freeman	96,833	38,824	104,820	240,477	16,537	3,166	91,045	110,748	202,471	148,754	151,501 87	43,505 30	17,337 71	212,344 88
Bicknell	6,099	2,265	2,511	10,875	.....	.....	.....	.....	10,875	.....	5,914 07	2,580 72	3,283 77	11,778 56
Tecumseh	155,013	67,729	108,083	330,825	325	.....	555	880	179,432	152,273	179,245 88	35,766 65	14,990 46	230,002 99
Total	304,480	133,927	372,843	811,250	24,062	7,168	140,967	172,197	532,947	450,500	$479,329 32	$136,616 79	$57,910 47	$673,856 58

PARKE COUNTY.

Parke No. 12	.....	.....	22,961	22,961	.....	.....	.....	.....	.....	22,961	$25,524 66	$6,638 24	$4,470 30	$36,633 20
Parke No. 11	.....	.....	126,113	126,113	.....	.....	76,404	76,404	60,469	142,048	105,665 40	41,027 76	14,665 04	161,358 20
Lyford No. 1	14,168	2,164	89,514	105,846	.....	.....	.....	.....	.....	105,846	54,300 50	35,600 61	12,674 34	102,575 45
Total	14,168	2,164	238,588	254,920	.....	.....	76,404	76,404	60,469	270,855	$185,490 56	$83,266 61	$31,809 68	$300,566 85

PIKE COUNTY.

Ayrshire No. 5	52,163	32,309	22,273	106,745	.....	.....	.....	.....	48,768	57,977	$52,580 33	$15,069 97	$7,526 06	$75,176 36
Peacock No. 2	36,437	23,543	3,317	63,297	.....	.....	.....	.....	38,456	24,841	34,903 31	11,357 84	7,005 28	53,266 43
Total	88,600	55,852	25,590	170,042	.....	.....	.....	.....	87,224	82,818	$87,483 64	$26,427 81	$14,531 34	$128,442 79

SULLIVAN COUNTY.

Rainbow	59,474	53,890	54,057	167,421						167,421	$95,280 69	$37,481 81	$17,330 81	$150,093 31
Phoenix No. 4	60,493	47,402	76,216	184,111						184,111	106,972 29	49,617 78	16,965 73	173,555 80
Hocking	32,490	18,574	76,295	127,359						127,359	61,596 03	28,905 37	10,389 90	100,891 30
Sunflower	101,758	44,820	107,756	254,334					26,002	288,332	135,993 84	18,802 32	36,689 59	191,485 75
Consolidated No. 25	52,765	41,176	32,677	126,618					16,816	109,802	64,783 21	54,990 57	14,254 62	134,028 40
Consolidated No. 26	7,678	3,501		11,179					5,513	5,666	24,313 24	8,083 06	2,605 40	35,001 70
Consolidated No. 28	Idle.													
Consolidated No. 30	65,854	51,007	24,645	141,506					26,063	115,443	75,880 68	49,162 80	14,931 89	139,975 37
Consolidated No. 33	166,173	59,115	115,348	340,636						340,636	186,160 29	111,712 81	19,134 06	317,007 16
Vandalia No. 10	128,567	43,017	184,199	355,783					304,300	51,483	179,430 90	73,236 07	19,225 41	271,892 38
Jackson Hill No. 2	74,584	224,346	79,853	378,783					291,703	87,080	97,559 33	47,549 83	10,710 66	155,819 82
Jackson Hill No. 4	117,195	82,322		199,517					91,109	108,408	107,212 98	48,477 59	10,743 85	166,434 42
Dering No. 13	26,485	12,377	76,697	115,559					115,559		53,239 12	36,393 64	9,035 44	98,668 20
Dering No. 14	77,110	62,363	26,020	165,493						165,493	86,856 05	62,530 98	15,319 40	164,706 43
Mammoth	97,005	57,243	56,038	210,286						210,286	119,369 85	46,578 24	15,485 08	181,433 17
C. & I	18,044	8,122	16,185	42,351	43,224	20,486	53,188	116,898	159,249		106,661 17	39,587 02	7,509 52	153,757 71
Shirley Hill No. 3	47,284	23,267	36,296	106,847	30,199	16,056	22,170	68,425	175,272		106,260 26	25,061 74	7,526 00	138,848 00
Little Giant	21,952	10,859	87,496	120,307	26,410	13,311	119,390	159,111	171,141	108,277	172,516 26	58,399 44	12,133 90	243,049 60
Clover Leaf	13,940	7,762	4,374	26,076	57,958	35,008	16,566	109,532	135,608		96,197 71	48,570 13	8,564 26	153,332 10
Pearl	23,728	12,043	22,749	58,520					21,460	37,060	29,556 10	13,912 93	7,926 28	51,395 31
Reliance	32,970	13,325	45,177	91,472	134	56	253	443	4,933	86,982	57,122 71	27,236 73	11,771 73	96,131 17
Black Hawk	14,179	8,834	16,272	39,285	39,548	31,210	49,736	120,494	48,225	111,554	82,752 72	17,309 36	9,916 04	109,978 12
Total	1,230,728	885,365	1,138,350	3,263,443	197,473	116,127	261,303	574,903	1,592,953	2,245,353	$2,045,715 43	$903,600 22	$278,169 57	$3,227,485 22

VERMILLION COUNTY.

Crown Hill No. 3	111,039	35,964	97,081	244,084					55,454	188,630	$163,776 02	$55,445 10	$110,88 93	$230,310 05
Oak Hill	2,780	1,905	2,365	7,050	24,314	16,945	30,996	72,255		79,305	52,551 56	15,598 45	6,320 35	74,470 36
Crown Hill No. 4	12,637	4,212	2,077	18,926						18,926	12,074 26	7,150 28	1,625 05	20,849 59
Total	126,456	42,081	101,523	270,060	24,314	16,945	30,996	72,255	55,454	286,861	$228,401 84	$78,193 83	$19,034 33	$325,630 00

VIGO COUNTY.

NAME OF MINE.	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Vandalia No. 69	32,084	20,166	2,731	54,981	68,992	39,710	7,190	115,892	122,553	48,320	$101,538 73	$41,940 66	$10,770 04	$154,249 43
Wabash	21,620	11,462	195,674	228,756	25,155	1,374	25,155	51,684	164,435	115,905	146,278 75	38,038 10	10,693 00	195,009 85
Minshall	7,619	2,804	77,189	87,612	10,568	4,413	92,171	107,152	141,253	53,511	123,689 50	34,518 60	11,878 75	170,086 85
Deep Vein No. 4	70,712	37,307	64,098	172,117	12,833	7,174	15,355	35,362	102,141	105,388	113,457 47	43,982 27	10,573 20	168,012 94
Grant No. 3	35,391	28,941	90,195	154,527	17,858	12,357	14,858	45,073	.....	199,600	118,158 92	47,860 43	18,992 55	185,011 90
Glen Ayre No. 1	93,533	50,672	117,132	261,337	.....	.....	.....	.....	88,500	172,837	132,983 79	40,059 09	12,857 80	185,900 68
Glen Ayre No. 2	32,952	12,040	31,335	76,327	13,913	5,821	7,481	27,215	36,070	67,472	62,789 95	11,637 07	5,763 78	80,190 80
Total	293,911	163,392	578,354	1,035,657	149,319	70,849	162,210	382,378	654,952	763,083	$798,897 11	$258,036 22	$81,529 12	$1,138,462 45

WARRICK COUNTY.

Big Four	8,954	4,829	100,826	114,609	.....	.....	.....	.....	81,496	33,113	$55,841 86	$9,819 52	$11,611 86	$77,273 24
Electric	.....	.....	46,457	46,457	.....	.....	23,726	23,726	47,873	22,310	38,188 00	11,137 32	5,333 82	54,659 14
Dawson	7,290	6,298	37,627	51,215	.....	.....	.....	.....	8,650	42,565	27,170 59	8,654 22	3,738 25	39,563 06
Erie Canal	.....	.....	75,777	75,777	.....	.....	.....	.....	42,827	32,950	35,215 17	11,053 71	5,262 83	51,531 71
Polk No. 5	.....	.....	154,591	154,591	.....	.....	.....	.....	154,591	.....	77,784 05	14,586 05	10,421 65	102,791 75
John Bull	.....	.....	5,868	5,868	.....	.....	.....	.....	2,174	3,694	2,100 00	1,452 52	1,032 08	4,584 60
Total	16,244	11,127	421,146	448,517	.....	.....	23,726	23,726	337,611	134,632	$236,299 67	$56,703 34	$37,400 40	$330,403 50
Total machine bituminous mined coal	2,990,025	1,733,982	4,215,731	8,939,738	566,770	285,284	862,062	1,714,116	5,417,384	5,236,470	$5,681,496 14	$2,120,003 64	$724,326 47	$8,525,826 25
Total hand bituminous mined coal	.....	.....	.....	.....	1,909,796	1,508,921	3,177,214	6,595,931	2,551,353	4,044,578	$4,128,114 68	$1,243,364 64	$420,890 55	$5,792,369 87
Total bituminous coal	5,466,591	3,528,187	8,255,007	17,249,785	.....	.....	.....	.....	7,968,737	9,281,048	$9,809,610 82	$3,363,368 28	$1,145,217 02	$14,318,196 12

RECAPITULATION.

Showing Total Production and Wages of Indiana Mines for 1910.

TOTAL PRODUCTION OF BLOCK COAL.

	Machine Mined.				Pick Mined.				Distribution.		Wages Paid.			
	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Tons of Screened Coal.	Tons of Slack and Nut.	Tons of Mine Run.	Total Tons of All Kinds of Coal Produced.	Indiana.	Other States.	To Miners.	To Inside Day Men.	To Outside Day Men.	Total Wages.
Total mach. mined block coal	148,039	36,665	.....	184,704	38,924	10,885	.....	49,809	55,087	179,426	$182,589 46	$77,079 12	$27,340 21	$287,008 79
Total pick mined block coal	.....	.....	.....	.....	502,641	115,737	22,568	640,946	211,831	429,115	601,787 40	212,522 40	100,875 67	922,185 81
Total block coal	689,604	163,287	22,568	875,459	.....	.....	.....	.....	266,918	608,541	$784,377 20	$296,601 52	$128,215 88	$1,209,194 60

TOTAL PRODUCTION OF BITUMINOUS COAL.

Total bitum. mach. mined coal	2,990,025	1,733,982	4,215,731	8,939,738	566,770	285,284	862,062	1,714,116	5,417,384	5,236,470	$5,681,496 14	$2,120,003 64	$724,326 47	$8,525,826 25
Total bitum. pick mined coal	.....	.....	.....	.....	1,909,796	1,508,921	3,177,214	6,595,931	2,551,353	4,044,578	4,128,114 68	1,243,364 64	420,890 55	5,792,369 87
Total bituminous coal	5,466,591	3,528,187	8,255,007	17,249,785	.....	.....	.....	.....	7,968,737	9,281,048	$9,809,610 82	$3,363,368 28	$1,145,217 02	$14,318,196 12
Total mach. mined coal	3,138,064	1,770,647	4,215,731	9,124,442	605,694	296,160	862,062	1,763,925	5,472,471	5,415,896	$5,864,085 60	$2,197,082 76	$751,666 68	$8,812,835 04
Total pick mined coal	.....	.....	.....	.....	2,412,437	1,624,658	3,199,782	7,236,877	2,763,184	4,473,693	4,729,902 42	1,462,887 04	521,766 22	6,714,555 68
Grand total	6,156,195	3,691,474	8,277,575	18,125,244	.....	.....	.....	.....	8,235,655	9,889,589	$10,593,988 02	$3,659,969 80	$1,273,432 90	$15,527,390 72

TABLE

Exhibiting the Names of Coal Companies, Names of the Mines Operated by Them, the Railroad on Which Each Mine is Located, the Geological Number of the Different Coal Seams Mined, Character of Coal, Thickness of Seam in Feet and Inches and Depth of Overlying Strata.

CLAY COUNTY.

Name of Company.	Name of Mine.	Railroad.	Geological Number of Seam.	Thickness of Seam in Feet and Inches.	Depth of Overlying Strata.	Character of Coal.
McClelland Coal Co	Brazil Block No. 4	C. & E. I	III.	3′ 4″	146	Block
Zellar-McClellan Co	Superior No. 4	E. & I. (Centerpoint Branch)	IV.	4′ 2″	85	Block
Crawford Coal Co	Crawford No. 6	Vandalia	III.	3′ 4″	106	Block
Crawford Coal Co	Crawford No. 10	C. & E. I	IV.	3′ 10″	120	Block
Crawford Coal Co	Crawford No. 11	Main line Vandalia	IV.	3′ 4″	42	Block
Indiana Block Coal Co	Indiana Block No. 1	E. & I	IV.	2′ 10″	56	Block
Coal Bluff Mining Co	Plymouth No. 3	C. & E. I	III.	3′ 7″	115	Block
C. Ehrlich Coal Co	Klondyke No. 3	Vandalia	III.	7′ 6″	100	Bitu.
American Clay Mfg. Co	Monarch	Product consumed at factory	IV.	2′ 6″	75	Bitu.
Eureka Block Coal Co	Eureka No. 5	Big Four	III.	3′ 3″	115	Bitu.
Treager Bros	Treager No. 2	Wagon mine	IV.	3′ 8″	57	Bitu.
Harrison C. & Min. Co	Harrison No. 5	E. & I	IV.	4′ 6″	70	Block
Hall & Zimmerman	Wizard	Central Indiana	III.	3′ 4″	45	Block
Progressive C. & M. Co	Progressive	Main line Vandalia	IV.	3′ 10″	101	Block
Big Vein Mining Co	Lewis	S. I	V.	8′	80	Bitu.
Vivian Colliers Co	Vivian No. 1	S. I	III.	5′ 10″	160	Bitu.
Vivian Colliers Co	Vivian No. 2	S. I	IV.	4′ 2″	34	Bitu.
United Fourth Vein C. Co.	Island Valley No. 4	S. I	IV.	4′ 10″	104	Bitu.
German Coal Co	German	Wagon	IV.	4′	61	Block
Sam Pyrah	Pyrah	Wagon	IV.	3′ 6″	35	Block
Nick Schrepferman	Schrepferman	Main line Vandalia	IV.	3′ 9″	63	Block
Nick Schrepferman	Schrepferman	Wagon	III.	4′ 2″	67	Block
Bee Ridge Coal Co	Bee Ridge	Wagon	IV.	4′	30	Block

DAVIESS COUNTY.

Mutual Mining Co	Mutual	B. & O. S. W	Min.	3′ 9″	100	Bitu.
Daviess County C. Co	Montgomery No. 4	B. & O. S. W	V.	5′ 6″	238	Bitu.
W. J. Winterbottom	Horney No. 3	Wagon	Min.	3′ 9″	40	Bitu.
Mandabach	Mandabach	Wagon	V.	5′ 6″	97	Bitu.
River Island Coal Co	River Island	Wagon	Min.	3′ 6″	113	Bitu.
Winklepeck & Overton	Winklepeck	Wagon	Min.	3′	Drift	Bitu.

FOUNTAIN COUNTY.

Rush Coal Co	Indio	Clover Leaf	III.	4′ 6″	50	Bitu.

GIBSON COUNTY.

Princeton C. & Min. Co	Oswald	Southern	V?.	6′ 10″	440	Bitu.
Fort Branch Coal Co	Fort Branch	E. & F. H	VI.	4′ 6″	265	Bitu.
Wyoming Coal Co	Francisco	Southern	VI.	4′	132	Bitu.

GREENE COUNTY.

Name of Company.	Name of Mine.	Railroad.	Geological Number of Seam.	Thickness of Seam in Feet and Inches.	Depth of Overlying Strata.	Character of Coal.
United Fourth Vein C. Co.	Black Creek	S. I.	IV.	4′ 6″	83	Bitu.
United Fourth Vein C. Co.	Michason	S. I.	IV.	4′ 6″	81	Bitu.
United Fourth Vein C. Co.	Sponsler	S. I.	IV.	5′ 3″	50	Bitu.
United Fourth Vein C. Co.	Antioch	S. I. Br.	IV.	4′ 4″	168	Bitu.
United Fourth Vein C. Co.	North Linton	S. I.	IV.	4′	64	Bitu.
Vandalia Coal Co	Vandalia No. 2	I. & V. Br.	IV.	5′	66′ 6″	Bitu.
Vandalia Coal Co	Vandalia No. 4	I. & V. Br.	IV.	5′	55	Bitu.
Vandalia Coal Co	Vandalia No. 5	I. & V. Br.	IV.	5′	91	Bitu.
Vandalia Coal Co	Vandalia No. 8	I. & V. Br.	IV.	5′ 6″	130	Bitu.
Vandalia Coal Co	Vandalia No. 9	I. & V. Br.	IV.	5′	129	Bitu.
Vandalia Coal Co	Vandalia No. 20	I. & V. Br.	V.	6′ 6″	100	Bitu.
Vandalia Coal Co	Vandalia No. 21	I. & V. Br.	V.	7′	112	Bitu.
Alliance Coal Co	Gilmour	S. & I.	IV.	5′ 2″	155	Bitu.
Summit C. & Min. Co	Summit No. 2	I. & V. Br.	IV.	5′ 6″	150	Bitu.
Green Valley Coal Co	Green Valley	S. I.	IV.	5′	160	Bitu.
Alliance Coal Co	Lattas Creek	S. I.	IV.	5′ 4″	153	Bitu.
Queen Coal Co	Queen	S. I.	IV.	3′ 9″	90	Bitu.
Calora Coal Co	North West	S. I.	IV.	4′ 4″	84	Bitu.
Coal Bluff Min. Co	Twin No. 4	S. I.	V.	4′ 4″	60	Bitu.
Coal Bluff Min. Co	Twin No. 5	S. I.	IV.	6′ 4″	160	Bitu.
Cherry Hill Coal Co	Cherry Hill	S. I.	IV.	5′	45	Bitu.
Letsinger Coal Co	Letsinger	S. I.	III.	7′	200	Bitu.
McKircher Bros. C. Co	P. & I	S. I.	III.	6′ 6″	216	Bitu.
United Fourth Vein C. Co.	Black Creek No. 2	S. I.	IV.	4′ 6″		
United Fourth Vein C. Co.	Sponsler No. 2	S. I.	IV.			

KNOX COUNTY.

Knox Coal Co	Knox	I. & V.	V.	7′	207	Bitu.
Lynn Coal Co	Lynn	I. & V.	V.	5′	185	Bitu.
Freeman Coal Co	Freeman	I. & V.	V.	7′ 6″	240	Bitu.
Bicknell Coal Co	Bicknell	I. & V.	V.	7′	200	Bitu.
Washington-Wheatland Coal Co	Wheatland	B. & O. S. W.	V.	5′ 6″	238	Bitu.
Tecumseh C. & Min. Co.	Tecumseh	I. & V.	V.	5′ 6″	154	Bitu.

PARKE COUNTY.

McClelland Block C. Co.	Brazil No. 9	C. & E. I.	IV.	4′ 3″	121	Block
			IV.	4′ 4″	90	
Zellar-McClellan Co	Superior No. 2	C. & E. I.	III.	3′ 4″	123	Block
			IV.	4′ 4″	55	
Zellar-McClellan Co	Superior No. 3	C. & E. I.	III.	3′ 3″	85	Block
Zellar-McClellan Co	Superior No. 5	C. & E. I.	III.	3′ 4″	150	Block
Fairview Coal Co	Fairview	C. & E. I.	M.	5′	240	Bitu.
Parke County C. Co	Parke No. 11	Vandalia	III.	6′ 6″	125	Bitu.
Parke County C. Co	Parke No. 12	Vandalia	III.	6′ 7″	176	Bitu.
Vivian Colliers	Lyford No. 1	C. & E. I.	III.	6′	160	Bitu.
James Moore	Moore	Wagon	IV.	4′	24	Block
W. P. Harrison	Harrison	Wagon	M.	3′ 5″	Solpe	Bitu.
S. B. Coal Co	No. 1	Wagon	IV.	4′ 2″	27	Block

PERRY COUNTY.

Lincoln Coal & Min. Co.	Lincoln	Southern	M.	4′	Slope	Bitu.

PIKE COUNTY.

Name of Company.	Name of Mine.	Railroad.	Geological Number of Seam.	Thickness of Seam in Feet and Inches.	Depth of Overlying Strata.	Character of Coal.
Ayrshire Coal Co	Ayrshire No. 4	M. L. South	V.	5′	Drift	Bitu.
Ayrshire Coal Co	Ayrshire No. 5	M. L. South	V.	5′	Slope	Bitu.
Cent. Ind. Coal & Min. Co.	Muren	M. L. South	V.	4′	Slope	Bitu.
S. W. Little Coal Co	Blackburn No. 1	E. & I	V.	7′ 6″	Slope	Bitu.
S. W. Little Coal Co	Blackburn No. 2	E. & I	V.	6′	70	Bitu.
S. W. Little Coal Co	Littles	E. & I	V.	6′	80	Bitu.
Peacock C. & Min. Co	Peacock No. 2	E. & I	VI.	7′ 6″	Slope	Bitu.
Winslow Gas & C. Co	Winslow No. 4	M. L. S	V.	5′	Drift	Bitu.
Winslow Gas & C. Co	Winslow No. 5	M. L. S	V.	5′	Drift	Bitu.
J. W. Welsh	Hartwell No. 1	M. L. S	V.	4′ 8″	Drift	Bitu.
J. W. Welsh	Hartwell No. 2	M. L. S	V.	4′ 8″	Drift	Bitu.
J. W. Welsh	Hartwell No. 3	M. L. S	V.	4′ 8″	Drift	Bitu.

SULLIVAN COUNTY.

Alliance Coal Co	Rainbow	I. S	VI.	5′	92	Bitu.
Alliance Coal Co	Phoenix No. 4	E. & T. H	VI.	5′ 6″	202	Bitu.
Alliance Coal Co	Hocking	E. & T. H	VI.	5′ 2″	219	Bitu.
Alliance Coal Co	Mammoth	S. I	VI.	5′ 2″	177	Bitu.
Sunflower Coal Co	Sunflower	I. C	VI.	5′ 9″	104	Bitu.
Consolidated Ind. C. Co	Consolidated No. 25	E. & T. H	VI.	5′	221	Bitu.
Consolidated Ind. C. Co	Consolidated No. 26	E. & T. H	VI.	5′ 5″	197	Bitu.
Consolidated Ind. C. Co	Consolidated No. 28	S. I	VI.	5′ 6″	197	Bitu.
Consolidated Ind. C. Co	Consolidated No. 30	S. I	VI.	5′ 6″	187	Bitu.
Consolidated Ind. C. Co	Consolidated No. 32	S. I	V.	7′	108	Bitu.
Consolidated Ind. C. Co	Consolidated No. 33	E. & T. H	V.	6′	103	Bitu.
Vandalia Coal Co	Vandalia No. 10	I. & V. Br	IV.	5′ 6″		Bitu.
Jackson Hill C. & Coke Co	Jackson Hill No. 2	E. & T. H. Br	VI.	5′ 6″	105	Bitu.
Jackson Hill C. & Coke Co	Jackson Hill No. 4	E. & T. H. Br	VI.	5′ 8″	165	Bitu.
Gregory Coal & Min. Co	Keystone	E. & T. H	V.	5′	305	Bitu.
Brazil Block Coal Co	Dering No. 13	E. & T. H	VI.	5′ 8″	144	Bitu.
Brazil Block Coal Co	Dering No. 14	E. & T. H	VI.	6′	1[illegible]3	Bitu.
Chicago-Ind'pls Coal Co	C. & I. No. 1	C. I. & L	VI.	5′ 6″	111	Bitu.
Shirley Hill Coal Co	Shirley Hill No. 3	I. & V. Vandalia	VI.	5′ 6″	104	Bitu.
Shirley Hill Coal Co	Little Giant	C. I. & L	VI.	5′ 9″	109	Bitu.
Shirley Hill Coal Co	Clover Leaf	I. S	IV.	5′	313	Bitu.
Kettle Creek Coal Co	Pearl	S. I	VI.	5′ 10″	170	Bitu.
Peabody-Alwart Coal & Mining Co	Reliance	E. & T. H	VI.	5′ 6″	228	Bitu.
United Fourth Vein C. Co.	Black Hawk	S. I. R. R	III.	6′	229	Bitu.
Carlisle Coal & Clay Co	Viola	E. & T. H	V.	4′ 8″	305	Bitu.
W. C. Hall Mining Co	Freeman	I. C	VI.	5′ 6″	110	Bitu.
Hudson Coal & Mining Co.	Hudson	S. I	VII.	5′	112	Bitu.
Bellevue Coal Co	Bellevue	E. & T. H. M. L	V.	5′	335	Bitu.
Larsh Coal Co	Larsh	Wagon	VI.	5′ 3″	104	Bitu.
Averill Coal & Mining Co.	Hamilton	E. & T. H	III.	6′	254	Bitu.

VANDERBURGH COUNTY.

Diamond Coal Co	Diamond	Wagon	V.	4′	244	Bitu.
Gileson Moore C. Co	Ingleside	L. & N	V.	4′	265	Bitu.
Sunnyside Coal Co	Sunnyside	L. & N	V.	4′	268	Bitu.
Crescent Coal Co	Unity	L. & N	V.	4′	265	Bitu.
Banner Coal Co	First Avenue	Wagon	V.	4′	261	Bitu.

VERMILLION COUNTY.

Brazil Block Coal Co	Dering No. 8	C. & E. I.	IV.	5′ 3″	200	Bitu.
Silverwood Coal Co	Eureka	Con. Coal	M.	4′ 6″	110	Bitu.
Clinton Coal Co	Crown Hill No. 1	C. & E. I.	V.	4′ 10″	165	Bitu.
Clinton Coal Co	Crown Hill No. 2	C. & E. I.	V.	4′ 10″	155	Bitu.
Clinton Coal Co	Crown Hill No. 3	C. & E. I.	III.	6′	345	Bitu.
Clinton Coal Co	Crown Hill No. 4	C. & E. I.	IV.	4′ 6″	249	
Clinton Coal Co	Crown Hill No. 5	T. H. & Southern	V.	5′	182	Bitu.
Oak Hill Coal Co	Oak Hill No. 50	C. & E. I.	V.	4′ 10″	57	Bitu.
Oak Hill Coal Co	Maple Valley	C. & E. I.	V.	5′ 6″	225	Bitu.
Oak Hill Coal Co	Buckeye No. 2	C. & E. I.	V.	4′ 8″	149	Bitu.
Oak Hill Coal Co	Klondyke	C. & E. I.	III.	7′	300	Bitu.

VIGO COUNTY.

Vandalia Coal Co	Vandalia No. 66	Main line Vandalia	III.	5′	102	Bitu.
Vandalia Coal Co	Vandalia No. 67	Main line Vandalia	III.	7′ 6″	100	Bitu.
Vandalia Coal Co	Vandalia No. 69	Main line Vandalia	III.	5′	120	Bitu.
Vandalia Coal Co	Vandalia No. 81	Main line Vandalia	III.	4′ 6″	64	Bitu.
Alliance Coal Co	Forrest	Big Four	III.	6′ 6″	159	Bitu.
Otter Creek Coal Co	Mary No. 2	C. & E. I.	IV.	3′ 9″	257	Block
Retlaw Mining Co	Atherton	C. & E. I.	III.	6′	158	Bitu.
Coal Bluff Mining Co	Riverside	Big Four	V.	4′ 5″	165	Bitu.
Coal Bluff Mining Co	Wabash	Big Four	IV.	5′ 4″	300	Bitu.
Coal Bluff Mining Co	Plymouth No. 1	Big Four	III.	3′ 11″	224	Block
Coal Bluff Mining Co	Minshall	Big Four	Min.	5′	175	Bitu.
Lower Vein Coal Co	Lower Vein No. 1	Big Four	V.	4′ 8″	192	Bitu.
Miami Coal Co	Miami No. 2	C. & E. I.	III.	6′	55	Bitu.
Miami Coal Co	Miami No. 4	C. & E. I.	III.	6′ 6″	55	Bitu.
Miami Coal Co	Miami No. 5	C. & E. I.	III.	5′ 6″	40	Bitu.
Miami Coal Co	Miami No. 6	C. & E. I.	IV.	5′	160	Bitu.
Fauvre Coal Co	Fauvre No. 2	Main line Vandalia	V.	4′ 6″	219	Bitu.
Deep Vein Coal Co	Deep Vein No. 5	Main line Vandalia	V.	4′ 6″	170	Bitu.
Deep Vein Coal Co	Deep Vein No. 4	Main line Vandalia	IV.	4′ 3″	280	Bitu.
Grant Coal & Mining Co	Grant No. 3	C. & E. I.	III.	6′ 6″	35	Bitu.
Sugar Valley Coal Co	Sugar Valley	Wagon mine	V.	4′ 4″	140	Bitu.
Brazil Block Coal Co	Dering No. 6	C. & E. I.	V.	4′ 8″	111	Bitu.
National Coal & Fuel Co	National	Main line Vandalia	VII.	4′ 8″	42	Bitu.
Domestic Block C. Co	Domestic Block No.1	C. & E. I.	IV.	3′ 8″	110	Block
Glen Ayre Coal Co	Glen Ayre No. 1	Main line Vandalia	IV.	5′	90	Bitu.
Glen Ayre Coal Co	Glen Ayre No. 2	Main line Vandalia	IV.	5′ 1″	74	Bitu.
Pittsburg Mining Co	Pittsburg No. 1	Big Four	VII.	5′ 8″	260	Bitu.
C. A. Nash Coal Co	Nash	C. & E. I.	IV.	4′	Slope	Bitu.
Vigo County C. Co	Ray No. 2	Main line Vandalia	III.	7′	97	Bitu.

WARRICK COUNTY.

Big Four Coal Co	Big Four No. 2	Evansville Div. So.	V.	6′	Slope	Bitu.
Big Four Coal Co	Big Four No. 3	Evansville Div. So.	V.	5′	Slope	Bitu.
Chandler Coal Co	Chandler	Evansville Div. So.	V.	4′ 5″	120	Bitu.
Chas. Menden C. Co	De Forrest	Evansville Div. So.	V.	6′	65	Bitu.
T. D. Scales Coal Co	Electric	Evansville Div. So.	V.	6′ 5″	45	Bitu.
Caledonia Mining Co	Dawson	Evansville Div. So.	V.	5′	86	Bitu.
Erie Canal Coal Co	Erie Canal	Evansville Div. So., Newburg & Evansv.	V.	4′ 5″	130	Bitu.
Red Shaft Coal Co	Red Shaft (Old Star No. 1)	E. E. Electric	V.	4′	180	Bitu.
J. Wooley Coal Co	Polk No. 4 and 5	Evansville Div. So.	V.	6′ 6″	Slope	Bitu.
J. Wooley Coal Co	Castle Garden	Evansville Div. So., Newburg & Evansv.	V.	4′ 2″	80	Bitu.
Worsham-Newburg C. Co.	Brizius	E. E. Electric	V.	4′	128	Bitu.
Epworth Coal Co	Epworth	E. E. Electric	V.	4′	114	Bitu.
Sargent Coal Co	Sargent	E. E. Electric	V.	4′	96	Bitu.
Elberfeld Coal Co	Elberfeld	E. & I.	V.	5′	196	Bitu.
Henry Korff Coal Co	Korff	Evansville Div. So.	V.	6′	50	Bitu.
White & Wilson	John Bull	Southern	V.	5′ 6″	60	Bitu.

NEW MINES.

Thirteen new mines were opened during the year 1910, located in six different counties, as follows:

Clay County, five block coal mines.
Knox County, one bituminous.
Parke County, one bituminous and one block.
Vermillion County, two bituminous.
Vigo County, three bituminous.
Warrick County, one bituminous mine.

The annexed table shows the names by which each new mine is known, the names of the different Coal companies operating them, the location of each mine, i. e., County, Section, Town, Range and T. P. and Railroad on which each mine is located, whether machine or hand mine, geological number and thickness of coal seam in feet and inches, whether block or bituminous coal, depth of overlying strata, size of shaft and the date of the first shipment of coal:

TABLE OF NEW MINES.

CLAY COUNTY.

Name of Company.	Name of Mine.	Location of Mine.	Railroad.	Hand or Machine.	Geological Number of Coal. Seam	Block or Bituminous.	Thickness of Seam in Feet and Inches.	Depth of Overlying Strata in Feet.	Size of Shaft.	Date of First Shipment of Coal.
Treager Bros.....	Treager.....	N. E. ¼ Sec. 7, T. 12 N., R. 7 W., Posey Tp.	Wagon or local mine..	Hand....	IV.	Block..	3′ 8″	56	7x14	May, 1910
Crawford Coal Co..	Crawford No. 11...	S. E. ¼ Sec. 33, T. 12 N., R. 6 W., Jackson Tp.	Center Point Br. Van.	Hand....	IV.	Block..	3′ 4″	42	8x20	Aug. 12, 1910
Schrepferman.....	Schrepferman No. 2	S. E. ¼ Sec. 6, T. 12 N., R. 6 W., Jackson Tp.	Vandalia Br.....	Hand....	IV.	Block..	3′ 9″	63	8x18	July 8, 1910
Bee Ridge.....	Bee Ridge.....	.....	Wagon.....	Hand....	Ryder	Block..	4′	30		

KNOX COUNTY.

Bicknell Coal Co...	Bicknell.....	Sec. 21, T. 4 N., R. 8 W., Vigo Tp.	I. & V., Vandalia....	Machine.	V.	Bitum.	7′	200	7x13	August.

PARKE COUNTY.

Parke Co. Coal Co.	Parke No. 12.....	S. W. ¼ Sec. 28, T. 14 N., R. 8 W., Floyd Tp.	Logansport Div. Van.	Machine.	III.	Bitum.	7′	176	8x18	
S. B. Coal Co.....	S. B. Mine.....	N. W. ¼ S. E. ¼ Sec. 8, T. 17 N., R. 7 W.	Wagon mine.....	Hand....	IV.	Block..	4′ 2″	27	7x8	Sept. 5.

VERMILLION COUNTY.

Clinton Coal Co....	Crown Hill No. 4..	S. W. ¼ N. E. ¼ Sec. 29, T. 14 N., R. 9 W., Clinton Tp.	C. & E. I.....	Machine.	IV.	Bitum.	4′ 6″	249	17′ 10″x9′ 10″	Dec. 7, 1910
Clinton Coal Co....	Crown Hill No. 5..	S. W. ¼ N. W. ¼ Sec. 24, T. 14, N., R. 10 W., Clinton Tp.	C. T. H. & S. E.....	Hand....	V.	Bitum.	5′	182	17′ 4″x9′ 9″	Dec. 5, 1910

VIGO COUNTY.

Name of Company.	Name of Mine.	Location of Mine.	Railroad.	Hand or Machine.	Geological No. of Coal Seam.	Block or Bituminous.	Thickness of Seam in Feet and Inches.	Depth of Overlying Strata in Feet.	Size of Shaft.	Date of First Shipment of Coal.
C. A. Nash.....	Nash.....	N. W. ¼ Sec. 17, T. 13 N., R. 7 W., Navins Tp.	C. & E. I.....	Hand....	IV.	Bitum.	4′	Slope	.....	Dec. 8, 1910
Miami Coal Co.....	Miami No. 6.....	S. W. ¼ Sec. 4, T. 13 N., R. 9 W., Fayette Tp.	C. & E. I.....	Hand....	V.	Bitum.	5′	156	8x16	May 1, 1910
Jackson Hill C. Co.	Jackson Hill No. 5.	N. E. ¼ Sec. 16, T. 13 N., R. 9 W., Fayette Tp.	C. & E. I.....	Machine.	IV.	Bitum.	5′	180	8′ 10″x18′	Oct., 1910

WARRICK COUNTY.

Wilson & White.....	John Bull.....	Sec. 29, T. 5 N., R. 8 W., Boon Tp.	Southern.....	Machine.	V.	Bitum.	5′ 6″	60	9x18	Mar. 1, 1910

CHANGES IN OWNERSHIP AND MANAGEMENT OF MINING PROPERTIES.

Transfers in the ownership and the management of mining properties were made during the year as follows:

The Atherton Mine, located in Vigo County, owned by the Atherton Splint Coal Company, changed hands in January. It was purchased by W. S. Bogle and others, who organized the Retlaw Coal Company. This company sunk a second escape shaft during the year and made other extensive improvements, placing the mine among the foremost producers in the county.

The Winslow Gas & Coal properties, located in Pike County, owned by the Cedar Creek Coal Company, were leased in January by H. A. Lobey and were later re-leased to the John Jennings Coal Company.

The Letsinger Coal Company was reorganized in January under the name of the Florence Coal Company, which now operates the Letsinger mine.

The control and management of the National Coal and Fuel Company's mine, located at West Terre Haute, was assumed in January by the Richards & Sons Coal Company.

Changes in the management of the Alliance Coal Company mining properties were made in February. Mr. John E. Windsor succeeded Mr. J. K. Seifert and was appointed vice-president of the company, with offices in the Old Colony Building, Chicago. Mr. Frank Fisher succeeded John Gilmour as general superintendent, and he is now general manager, with office in Terre Haute.

The Hudson Mine, Sullivan County, changed hands during the fall and is now operated by the Sullivan Coal Product and Mining Company.

The Chandler Mine, Warrick County, went into the hands of a receiver during the fall, Mr. W. H. Ferguson, of Evansville, being appointed receiver.

The Hamilton Mine, Sullivan County, was purchased during the summer by the Averill Coal Mining Company, and the work of cleaning up the mine, which had been idle for over a year, was commenced in September.

The Brazil Block Coal Company's Mines Nos. 4 and 9 were purchased in December by the McClelland Block Coal Company.

IMPROVEMENTS.

Expenditures reported to this office by the different coal companies as having been made for improvements of different kinds in or about the mines of Indiana during the year 1910 represent an aggregate of $24,868.37. The sums expended on mines in the different counties are as follows: Clay County, $7,838.50; Fountain County, $170.70; Knox County, $600.00; Parke County, $215.16; Sullivan County, $508.37; Vermillion County, $9,605.00; Vigo County, $499.30; Warrick County, $5,431.34.

These figures, however, do not represent the total expenditures for improvements. In a number of mines high-speed fans, motor haulage, etc., were installed and the labor and cost of installation was charged to operating expense.

TABLE.

Showing Number of Miners, Machine Runners and Helpers, Loaders, Inside Day and Monthly Men, Persons Employed Outside; Total Number of Employes at Each Mine, Number of Days Worked and Number of Mules Used; Totals by Counties, the Block and Bituminous Mines Shown Separately.

BLOCK HAND MINES.

CLAY COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Brazil Block No. 1	20	10	4	34	26	6	81
Brazil Block No. 4	93	33	11	137	269	14	4,103
Superior No. 4	41	15	5	61	267	6	2,079
Crawford No. 2	24	14	5	43	187	3	687
Crawford No. 6	55	16	6	77	267	5	2,776
Crawford No. 9	11	3	4	18	34	1	124
Crawford No. 10	100	30	9	139	254	8	6,496
Indiana Block No. 1	38	8	5	51	219	4	1,477
Plymouth No. 2	54	16	6	76	269	6	4,045
Monarch	25	7	2	34	248	4	697
Eureka No. 5	75	22	8	105	258	9	4,410
Treager	11	2	2	15	90	1	162
Pyrah	7	3	2	12	25	1	.....
Harrison No. 5*	.....	.....	.....	.....	.....	.....	.....
Wizard	63	16	6	85	196	6	1,176
Progressive	30	4	3	37	100	2	313
Schefferman*	.....	.....	.....	.....	.....	.....	.....
Crawford No. 11	26	14	5	45	67	2	373
Bee Ridge	8	9	2	19	98	1	.....
German*	.....	.....	.....	.....	.....	.....	.....
Total	681	222	85	988	2,874	79	28,999

*Not reported.

PARKE COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Brazil Block No. 9	53	22	6	81	196	13	2,548
Brazil Block No. 12	14	4	4	22	70	1	227
Superior No. 2	48	20	7	75	235	10	2,665
Superior No. 3	78	22	7	107	244	9	3,608
Superior No. 5	118	22	7	147	224	10	5,749
Mooret	.....	.....	.....	.....	.....	.....	.....
S. B	.....	.....	.....	.....	.....	.....	.....
Total	311	90	31	432	969	43	14,797
Total for block hand mines.	992	312	116	1,420	3,843	122	43,796

†Less than ten men.

BLOCK COAL MACHINE MINES.

PARKE COUNTY.

Name of Mine.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Mary No. 1	10	8	21	16	10	65	93	5	317
Total	10	8	21	16	10	65	93	5	317

VIGO COUNTY.

Plymouth No. 1	51	12	51	27	12	153	264	9	3,582
Domestic Block No. 1	11	12	50	35	14	122	227	12	981
Mary No. 2	20	12	46	22	11	111	245	6	1,949
Total	82	36	147	84	37	386	736	27	6,512
Totals for mach. block	92	44	168	100	47	451	829	32	6,829
Totals for hand block	992	.....	.....	312	116	1,420*	3,843	122	43,796
Totals for all block mines	1,084	44	168	412	163	1,871	4,672	152	50,625

BITUMINOUS HAND MINES.

CLAY COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Klondyke No. 3	112	21	8	141	253	6	4,141
Vivian No. 1	Idle.	.....	.....	.....	.....	.....	.....
Gifford No. 2	43	9	7	59	152	4	1,416
Total	155	30	15	200	405	10	5,557

DAVIESS COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Winklepeck*							
Montgomery No. 4	36	6	5	47	217	3	2,267
Winterbottom No. 3	12	1	2	15	188	2	300
Mutual	65	20	8	93	179	6	883
Mandabach†							
Pine Island No. 1*							
Total	113	27	15	155	584	11	3,450

*Less than ten men.
†Not reported.

FOUNTAIN COUNTY.

Indio	Idle.						

GREENE COUNTY.

Dickason	47	10	6	63	212	6	2,854
Sponsler	70	16	7	93	174	10	3,251
Antioch	Idle.						
North Linton	Idle.						
Vandalia No. 3	Idle.						
Vandalia No. 4	126	39	11	176	253	12	7,147
Queen	108	33	12	153	234	11	7,384
Cherry Hill	23	4	6	33	225	2	1,408
Letsinger	65	22	11	98	225	6	4,174
Monarch*							
Enterprise	19	4	3	26	40	3	253
Total	458	128	56	642	1,363	50	26,471

*Not reported.

GIBSON COUNTY.

Oswald	141	62	13	216	275	26	9,116
Fort Branch	29	12	6	47	251	4	2,011
Francisco	18	4	3	25	242	2	1,228
Total	188	78	22	288	768	28	12,355

KNOX COUNTY.

Wheatland	47	9	6	62	217	5	2,527
Total	47	9	6	62	217	5	2,527

PARKE COUNTY.

Vandalia No. 316	126	51	13	190	66	24	1,121
Fairview	104	25	9	138	251	14	4,664
Total	230	76	22	328	317	38	5,785

PERRY COUNTY.

Lincoln	Idle.						
Total							

PIKE COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Ayrshire No. 4	161	31	16	208	234	11	9,904
Muren	Idle.						
Blackburn No. 1	28	9	7	144	257	7	2,318
Blackburn No. 2	53	16	8	77	216	5	3,314
Littles	150	40	10	200	213	16	5,611
Winslow No. 4 and 5	Idle.						
Hartwell No. 1, 2 and 3	Idle.						
Total	492	96	41	629	920	39	21,147

SULLIVAN COUNTY.

Hamilton	41	18	13	72	47	4	415
Superior (Hudson)	36	14	7	57	116	7	959
Consolidated Ind. No. 32	138	54	20	212	201	22	7,195
Citizens	23	9	8	40	67	6	560
Keystone	59	24	11	94	243	7	3,325
Viola	58	18	11	87	246	7	3,996
Larsh*							
Freeman	57	21	10	88	241	9	3,321
Bellevue	48	14	10	72	249	3	2,258
Total	460	172	90	722	1,410	65	22,029

*Less than ten men.

VANDERBURGH COUNTY.

First Avenue	44	9	10	63	249	7	2,156
Diamond	40	9	9	58	176	6	1,615
Ingleside	49	21	9	79	255	11	1,608
Sunnyside	47	9	5	61	239	6	2,157
Unity	124	42	19	185	231	12	7,336
Total	304	90	52	446	1,180	42	14,872

VERMILLION COUNTY.

Dering No. 8	220	68	10	298	252	23	11,460
Eureka	11	4	3	18		3	87
Crown Hill No. 1	234	44	12	290	271	16	18,238
Crown Hill No. 2	178	47	19	244	253	17	17,529
Maple Valley	69	15	11	95	100	4	2,448
Buckeye No. 2	161	53	11	225	146	28	14,952
Klondyke	169	34	14	217	264	15	13,291
Total	1,042	265	80	1,387	1,286	106	84,010

VIGO COUNTY.

Vandalia No. 66	110	49	12	171	244	19	5,621
Vandalia No. 67	200	57	18	275	248	26	8,764
Vandalia No. 81	55	27	10	92	256	13	3,319
Forrest	201	63	21	285	254	23	11,499
Atherton	105	47	8	160	267	14	7,732
Riverside	83	18	6	107	269	6	6,340
Lower Vein No. 1	190	50	14	254	275	20	12,285
Miami No. 2	66	19	7	92	74	10	910
Miami No. 4	222	41	11	274	274	25	12,585
Miami No. 5	62	16	9	87	263	5	4,317
Miami No. 6	67	17	8	92	250	6	4,997
Fauvre No. 2	73	14	7	94	255	6	4,510
Deep Vein No. 5*							
Ray No. 2	233	26	11	270	256	23	9,739
Sugar Valley	63	8	5	76	273	7	3,466
Dering No. 6	240	60	8	308	262	21	14,966
National	43	9	5	57	229	7	2,340
Pittsburg No. 1	180	48	12	240	257	17	10,116
Total	2,193	569	172	2,934	4,206	248	12,350

*Not working.

WARRICK COUNTY.

Name of Mine.	Miners.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Chandler	41	8	5	54	216	4	2,220
De Forrest	23	7	3	33	202	4	1,058
Brizius	26	3	4	33	165	4	722
Elberfield	40	10	6	56	230	7	2,147
Epworth*							
Korff	30	5	5	40	186	3	1,968
Sargent	30	4	5	39	241	4	1,561
Red Shaft*							
Castle Garden	51	16	6	73	230	8	3,021
Total	241	53	34	328	1,470	34	12,697
Total hand mine employes	5,923	1,593	605	8,121	14,126	676	334,406

*Less than ten men.

BITUMINOUS MACHINE MINES.

CLAY COUNTY.

Name of Mine.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Lewis	32	14	40	10	8	104	209	8	2,285
Vivian No. 2	22	10	46	22	12	112	192	12	1,963
Island Valley No. 4	31	16	105	54	15	221	269	14	4,181
Total	85	40	191	86	35	437	670	34	8,429

GREENE COUNTY.

Black Creek	19	10	45	29	10	113	156	9	1,919
Vandalia No. 2	66	20	51	41	13	191	243	12	3,578
Vandalia No. 5	55	8	52	52	21	188	259	16	3,095
Vandalia No. 8	5	18	133	79	20	255	245	13	2,134
Vandalia No. 9	12	24	190	90	23	339	257	15	3,602
Vandalia No. 20	102	20	43	26	11	202	257	8	3,854
Vandalia No. 21	10	28	82	35	17	172	240	12	1,961
Gilmour	31	18	120	63	19	251	235	17	1,857
Lattas Creek	19	30	162	80	24	315	249	20	4,289
Summitt No. 2	3	18	115	53	10	199	198	29	2,159
Green Valley		24	147	42	13	226	221	15	3,235
North West	34	14	63	44	11	166	235	12	2,079
Twin No. 4	17	6	38	21	4	86	212	7	1,118
Twin No. 5	27	12	88	33	8	168	241	13	2,859
Total	400	250	1,329	688	204	2,871	3,248	198	37,739

KNOX COUNTY.

Tecumseh		52	162	44	13	271	237	13	3,975
Knox	7	16	108	40	13	184	243	14	2,278
Lynn	30	8	23	28	7	96	263	11	3,100
Freeman	25	18	135	48	23	249	209	17	4,609
Bicknell		6	18	5	7	36	82	3	204
Total	62	100	446	165	63	836	1,034	58	14,166

PARKE COUNTY.

Name of Mine.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Lyford No. 1	.....	30	54	42	17	143	247	16	1,477
Parke No. 12	.....	16	26	10	10	62	87	2	556
Parke No. 11	35	26	55	47	12	175	270	14	3,735
Total	35	72	135	99	39	380	604	32	5,768

PIKE COUNTY.

Ayrshire No. 5	9	10	52	15	9	95	206	7	1,924
Peacock No. 2	4	10	38	10	8	70	238	4	1,040
Total	13	20	90	25	17	165	444	11	2,964

SULLIVAN COUNTY.

Rainbow	.....	16	109	50	19	194	231	19	3,139
Phoenix No. 4	.....	22	120	56	20	218	239	14	2,472
Hocking	.....	16	81	56	19	172	165	14	1,677
Sunflower	.....	20	123	44	17	204	269	18	2,615
Consolidated No. 25	.....	22	77	58	20	177	251	19	1,992
Consolidated No. 26	1	18	36	39	25	119	57	7	181
Consolidated No. 28	Idle.	.....	.....	.....	.....	.....	.....	.....	.....
Consolidated No. 30	.....	20	83	52	25	180	226	19	1,874
Consolidated No. 33	29	32	192	129	27	409	264	33	4,590
Vandalia No. 10	.....	24	151	83	25	283	264	19	3,478
Jackson Hill No. 2	10	18	90	34	18	170	249	17	1,543
Jackson Hill No. 4	.....	20	105	47	13	185	258	26	1,620
Dering No. 13	.....	14	66	40	12	132	221	16	1,315
Dering No. 14	.....	16	75	45	14	150	243	17	1,712
Mammoth	.....	20	112	62	24	218	224	16	2,994
C. & I	100	6	30	45	20	201	264	13	6,298
Shirley Hill No. 3	55	12	63	31	16	177	251	9	5,403
Little Giant	136	14	78	71	23	322	268	16	11,009
Clover Leaf	71	6	20	54	17	168	273	15	5,927
Pearl	.....	8	41	18	10	77	218	8	616
Reliance	.....	12	59	36	12	119	220	14	1,305
Black Hawk	90	6	25	23	12	156	227	9	6,151
Total	492	342	1,736	1,073	388	4,031	4,882	338	67,911

VERMILLION COUNTY.

Crown Hill No. 4	22	6	.....	16	12	56	101	3	1,279
Crown Hill No. 3	88	46	63	48	15	260	268	17	10,462
Oak Hill	41	4	16	19	6	86	260	7	6,005
Total	151	56	79	83	33	402	629	27	17,746

VIGO COUNTY.

Vandalia No. 69	113	8	61	66	17	265	254	22	5,888
Wabash	20	18	149	43	13	243	264	16	3,640
Minshall	102	16	55	50	10	233	274	25	7,891
Deep Vein No. 4	27	10	100	56	14	207	251	21	3,397
Grant No. 3	148	26	60	72	18	224	270	22	7,004
Glen Ayre No. 1	1	20	133	56	16	226	239	18	3,136
Glen Ayre No. 2	23	8	45	13	7	96	251	9	2,879
Total	434	106	603	356	95	1,594	1,803	133	33,835

WARRICK COUNTY.

Name of Mine.	Miners.	Machine Runners and Helpers.	Loaders.	Inside Employes.	Outside Employes.	Total Employes.	Days Worked.	Mules Used.	Powder.
Big Four	.....	18	54	12	16	100	205	8	1,506
Electric	27	6	23	18	10	84	176	10	1,831
Dawson	.....	14	30	11	7	62	255	8	780
Erie Canal	.....	8	40	16	7	71	215	10	990
Plok No. 5	.....	20	65	16	17	118	228	13	2,375
John Bull	.....	6	13	4	5	28	53	2	102
Total	27	72	225	77	62	463	1,132	51	7,584
Totals for bitum. machine mines	1,699	1,058	4,834	2,652	936	11,179	14,446	882	196,142
Totals for hand bitum. mines	5,923	.....	.....	1,593	605	8,121	14,126	676	334,406
Grand total for all mines in State	7,622	1,058	4,834	4,245	1,541	19,300	28,572	1,558	530,548

TABLE

Showing by Counties the Total Number of Kegs of Powder Used in 1910, the Number of Kegs per Miner, the Total Tons of Coal Produced and the Number of Tons Produced per Keg of Powder—the Block and Bituminous Mines Each Shown Separately, as are the Machine and Hand Mines—Also a General Average of Tons Produced per Keg in all the Mines in the State Combined.

BLOCK COAL HAND MINES.

County.	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Tons per Keg.
Clay	405,629	28,999	681	42.6—	14
Parke	235,317	14,797	311	47.6—	15.90—
General average	640,946	43,795	992	44.1—	14.63—

BLOCK COAL MACHINE MINES.

County.	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Tons per Keg.
Parke	12,521	317	39	8.0—	39.5—
Vigo	221,992	6,512	265	24.6—	34.08—
General average block machine mines	234,513	6,829	304	22.4—	35.133
General average block hand mines	640,946	43,795	992	44.1—	14.63
Total general average for all block mines	875,459	50,624	1,296	39—	17.2—

BITUMINOUS HAND MINES.

County.	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Tons per Keg.
Clay	150,602	5,557	155	35.8	27.1—
Daviess	72,692	3,450	113	30.5—	21—
Fountain	Idle.				
Gibson	285,101	12,355	188	65.7—	23—
Greene	535,759	26,471	458	57.8—	20.2—
Knox	62,421	2,527	47	53.7—	24.7—
Parke	148,565	5,785	230	25.1—	25.6—
Perry	Idle.				
Pike	429,910	21,147	492	43	20.3—
Sullivan	500,827	22,029	460	47.8—	22.7—
Vanderburgh	369,987	14,872	340	43.7—	24.8—
Vermillion	1,413,271	84,010	1,042	80.6—	16.8—
Vigo	2,476,954	123,506	2,193	56.3	20
Warrick	229,147	12,697	241	52.6—	18
General average bituminous hand mines.	6,675,236	344,406	5,923	58.1—	19.4—

BITUMINOUS MACHINE MINES.

County.	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Tons per Keg.
Clay	392,171	8,429	316	26.6	46.5
Greene	2,705,931	37,739	1,979	19—	71.7
Knox	983,447	14,166	608	16.9—	69.4
Parke	331,324	5,768	242	23	57.4
Pike	170,042	2,964	123	24	57.3
Sullivan	3,838,346	67,911	2,570	26	56.5
Vermillion	263,010	11,741	286	41	22.4
Vigo	1,418,035	37,301	1,143	33	38
Warrick	472,245	7,584	324	23	62.2
General average bituminous mach. mines.	10,574,549	193,600	7,591	25.5	54.6
General average bituminous hand mines..	6,675,236	344,406	5,923	58.1	19.1
General average all bituminous mines....	17,249,785	538,006	13,514	39.8	32

RECAPITULATION.

	Tons Produced.	Kegs Powder.	Number Miners.	Kegs per Miner.	Kegs per Ton.
General average for block hand mines.....	640,946	43,795	992	44.1—	14.63—
General average for block machine mines....	234,513	6,829	304	22.4—	35.1—
General average for bituminous hand mines..	6,675,236	344,406	5,923	58.1—	19.4—
General average for bituminous machine mines	10,574,549	193,600	7,591	25.5	54.6
Total general average for all mines in the State.....	18,125,244	588,626	14,810	39.7	32—

ABANDONED MINES.

Sixteen mines were abandoned during the year 1910, located in eight different counties, as follows:

In Clay there were four block and one bituminous, all hand mines. Greene, two bituminous, hand. Knox, one bituminous, hand. Parke, one block, machine; one block, hand; and one bituminous, hand. Pike, one bituminous, hand. Sullivan, one bituminous, machine. Vermillion, one bituminous, hand. Vigo, two bituminous, hand mines.

We give herewith a table exhibiting by counties the names of the mines abandoned, the names of the companies owning them, date of abandonment, and the railroad on which each mine was located:

TABLE.

CLAY COUNTY.

Name of Company.	Name of Mine.	Date of Abandonment.	Railroad.
Brazil Block Coal Co	Brazil Block No. 1	February 3	C. & E. I.
Crawford Coal Co	Crawford No. 2	September 30	Center Point Br., Vandalia.
Crawford Coal Co	Crawford No. 9	February 23	C. & E. I.
O. S. Richardson Coal Co	Gifford No. 2	August 15	C. & E. I.
Treager Bros	Treager No. 1	Date not given	Wagon mine.

GREENE COUNTY.

Vandalia Coal Co	Vandalia No. 6	January	I. & V. Coal Br.
Enterprise Coal Co	Enterprise	Date not given	I. & V. Coal Br.
United Fourth Vein Coal Co	Sponsler	September	S. I.

KNOX COUNTY.

Home Coal Co	Bicknell	Date not given	I. & V. Vandalia.

PARKE COUNTY.

Brazil Block Coal Co	Brazil Block No. 12	March 28	C. & E. I.
Otter Creek Coal Co	Mary No. 1	May	C. & E. I.
Vandalia Coal Co	Vandalia No. 316	March	Logansport, Vandalia.

PIKE COUNTY.

Petersburg	Dismantled in the spring	E. & I.

SULLIVAN COUNTY.

Name of Company.	Name of Mine.	Date of Abandonment.	Railroad.
Alliance Coal Co	Citizens	March 23	S. I.
VERMILLION COUNTY.			
Brazil Block Coal Co	Dering No. 5	January	C. & E. I.
VIGO COUNTY.			
Miami Coal Co	Miami No. 2	March 31	C. & E. I.
Vandalia Coal Co	Vandalia No. 81	December 31	Vandalia M. L.

EXAMINATIONS.

Examinations of applicants for certificates of competency to serve as mine bosses, fire bosses and hoisting engineers were held on three different dates in the city of Terre Haute. We give herewith the date of each examination, the total number of candidates examined, the total number passing a successful examination, the name and address of each person receiving a certificate, and the per cent. grade made by the holder thereof:

MINE BOSS.

Examination held May 10 and 11, 1910. Total number of Candidates, 24. Total number passed, 17.

Certificate No.	*Name and Address.*	*Per Cent.*
1.	Wm. Henry Luxton, Linton	77
2.	Robert Weston, Clinton	82
3.	Ive Cooprider, Clinton	88
4.	Thos. T. Jones, Carbon	81
5.	George Tucker, Linton	82
6.	Monroe Osborne, Shelburn	80
7.	Clifford Botts, Sullivan	76
8.	Marion Compton, Terre Haute	75
9.	Thomas Shull, Terre Haute	80
10.	Joe Weatherly, Princeton	79
11.	Wm. Jardine, Clinton	83
12.	M. C. Mitchell, Terre Haute	87
13.	Herschel Hawkins, Sullivan	82
14.	George Givens, Brazil	80
15.	C. E. Brooking, Jasonville	85
16.	Pete Butterman, Brazil	78
17.	Wm. Brewer, Jr., Dugger	85

FIRE BOSS.

Total number of Candidates 11. Total number passed, 9.

Certificate No.	*Name and Address.*	*Per Cent.*
1.	Chas. H. Coleman, Oakland City	75
2.	Jas. Brooks, Shelburn	76
3.	Jas. S. Townsley, Clinton	80
4.	Homer Cargal, Bicknell	79
5.	Thomas Campbell, Oakland City	75
6.	Henry White, Shelburn	80
7.	James A. Gowans, Shelburn	81
8.	B. F. Whittington, Sullivan	76
9.	Numa Chambornson, Linton	87

HOISTING ENGINEERS.

Total number of Candidates, 10. Total number passed, 3.

1.	E. G. Sargent, Newburg	83
2.	Oliver Snider, Chandler	82
3.	George O. Storer, Terre Haute	79

MINE BOSS.

Examination held August 17 and 18, 1910. Total number of Candidates, 30. Total number passed, 17.

18.	A. F. Odell, Evansville	84
19.	Timothy C. O'Connor, Staunton	87
20.	Charles Buckely, Sullivan	82
21.	Theo. Mason, Chandler	77
22.	James Sams, Chandler	83
23.	Clarence Filbert, Linton	80
24.	Henry M. Siepman, Brazil	77
25.	Dud King, Linton	80
26.	Edger Wallace, Shelburn	77
27.	James C. Gowans, Shelburn	80
28.	Joe Smith, West Terre Haute	79
29.	Robert A. Pettigren, Jasonville	77
30.	Edgar Crain, Linton	80
31.	John Dunlop, Peoria, Ill	91
32.	Tom Moses, Westville, Ill	91
34.	John Hewitt, Terre Haute	90
35.	Mack Nitterhouse, Terre Haute	90
10.	Reece H. Davies, Dugger	78
11.	Louis R. Thomas, Carlisle	79
12.	David Kendrick, Sullivan	78
14.	William Strachan, West Terre Haute	85
15.	Will Moody, Evansville	91
16.	Mathew Leckie, Sullivan	80
17.	Augustian Hie, Linton	82
18.	Arthur Hennette, Dugger	80

HOISTING ENGINEERS.

Total number of Candidates, 27. Total number passed, 11.

Certificate No.	*Name and Address.*	*Per Cent.*
4.	A. J. Marshall, Sullivan	82
5.	W. O. Cummins, Clinton	76
6.	James Burroughs, Center Point	79
7.	Samuel R. Freager, Brazil	83
8.	Carl Spangler, Cass	82
9.	Martin Oberholtzer, Linton	82
10.	George Annakin, West Terre Haute	79
11.	Otto Walker, Bicknell	80
12.	Henry V. Knapp, Coal Bluff	79
13.	John L. Sharps, Carbon	77
14.	Albert P. Davis, Sullivan	81
15.	Nute Hadley, Brazil	79

MINE BOSS.

Examination held December 20-21, 1910. Total number of Candidates, 78. Total number passed, 65.

33.	Ora Blackburn, West Terre Haute	77
34.	E. C. Goddard, Farmersburg	89
35.	Willie Johnston, Jr., Mecca	78
36.	Joseph Robinson, Shelburn	78
37.	Ivan R. Marshall, Lewis	78
38.	John Wittmer, Newburg	80
39.	R. E. Moore, Rockville	79
40.	William Moore, Knightsville	77
41.	William R. Davies, Sullivan	77
42.	Robert Pickett, Hymera	85
43.	R. Y. Williams, Evansville	95
44.	James Vallely, Sullivan	79
45.	Tom Thomas, Shelburn	78
46.	Jesse Fain, Hymera	77
47.	Oscar Cochran, Shelburn	78
48.	Geo. Badder, Vicksburg	76
49.	Ed. Stuck, Linton	77
50.	Albert A. Sams, Evansville	95
51.	Joseph Mitchell, Terre Haute	80
52.	John Mills, Shelburn	89
53.	Henry Ingle Stacer, Newburg	83
54.	Dave Kandrich, Sullivan	82
55.	Charles Lay, Chandler	80
56.	James Brooks, Shelburn	78
57.	Andrew Henderson, Bicknell	81
58.	Daniel Phillips, Hymera	78
59.	Jacob Riley, Shelburn	88
60.	Alonza J. Garwood, Terre Haute	88
61.	Thos. M. Gregory, Terre Haute	88

Certificate No.	*Name and Address.*	*Per Cent.*
62.	Isaiah Taylor, Cass	81
63.	Henry White, Shelburn	90
64.	Sidney C. Owens, Carbon	79
65.	James W. Edwards, Terre Haute	80
66.	Enoch Evans, Terre Haute	78
67.	Thomas James, West Terre Haute	80
68.	R. H. Thomas, Clinton	78
69.	David L. Jones, West Terre Haute	80
70.	Robert Bryce, Coalmont	80
71.	Numa Chamboudon, West Terre Haute	87
72.	Daniel Cummings, Linton	81
73.	Elgart L. Cooper, Francisco	79
74.	Robert E. Millard, Linton	85
75.	Alexander Cunningham, Carlisle	81
76.	A. J. Marks, Bicknell	87
77.	John C. Dersch, Brazil	81
78.	William J. Owens, Carbon	83
79.	John Jennings, Jr., Winslow	82
80.	Thomas G. Houchin, Little	79
81.	J. W. Black, Kingman	81
82.	John H. Wilkinson, Terre Haute	80
83.	Will Strachan, Terre Haute	82
84.	Wm. Bosmell, Linton	83
85.	Frank Sams, Chandler	86
86.	Robert Leigh, Evansville	84
87.	John Murphy, Terre Haute	88
88.	Harry Ferguson, Clinton	82
89.	L. R. Bledsoe, Sullivan	82
90.	Ed. Jones, Clinton	84
91.	Fred H. Hilgedirk, Linton	86
92.	Robert M. Wilson, Shelburn	88
93.	Henry D. Bredemeg, Linton	83
94.	Wilford Raines, Cass	79
95.	W. P. Davis, Linton	82
96.	Jacob Partington, Shelburn	80
97.	Hugh Reid, Brazil	85
98.	William P. Rollins, Terre Haute	88

FIRE BOSS.

Total number of Candidates, 23. Total number passed, 16.

19.	Henry Surmont, Sullivan	80
20.	Edward Atkinson, West Terre Haute	77
21.	Hugh Devitt, Shelburn	77
22.	E. G. Sargeant, Newburg	85
23.	George Ogilvie, Bicknell	83
24.	John Ogilvie, Bicknell	77
25.	Joseph Belshaw, Clinton	77
26.	James Dooley, St. Mary's	81

Certificate No.	*Name and Address.*	*Per Cent.*
27.	Gus Dow, Clinton	77
28.	J. C. Heenan, Indianapolis	80
29.	Charlie Vowel, Shelburn	76
30.	Thomas Hugo, Princeton	77
31.	Wm. Lewis, Princeton	79
32.	George Nevis, West Terre Haute	79
33.	John W. Stiles, Coalmont	80
34.	S. V. Risher, Shelburn	89

HOISTING ENGINEERS.

Total number of Candidates, 30. Total number passed, 23.

16.	Omar F. Walter, Clinton	78
17.	J. Bush Tribble, Linton	79
18.	Fred H. Knight, Sanford	76
19.	John O. Walter, Clinton	80
20.	Ed. Wright, Clinton	82
21.	Fred G. Walter, Clinton	77
22.	G. A. Brackney, Mecca	76
23.	J. W. Milbourn, Seelyville	84
24.	H. J. Peauler, Francisco	80
25.	Arthur Long, Center Point	85
26.	Ollie Pirkle, Winslow	77
27.	J. S. Johnson, Bicknell	80
28.	William Cox, Brazil	76
29.	Onis Rudolph, Boonville	81
30.	Ira S. Klinger, Sullivan	80
31.	James C. Anderson, Princeton	83
32.	Lee Courtney, Jasonville	82
33.	Robert McCollier, Sullivan	87
34.	Earl F. Smith, Linton	80
35.	Orce Wolford, Linton	78
36.	Walter C. Adams, Linton	77
37.	Denis M. O'Donnell, Terre Haute	78
38.	Jules J. Sarmont, Sullivan	95

OPINION OF ATTORNEY-GENERAL RELATING TO DUTIES OF MINE BOSS AND FIRE BOSS.

During my tenure of office I have had frequent inquiries as to whether persons who had qualified as both mine boss and fire boss would be permitted to perform the duties pertaining to both positions at the same time. These inquiries had become so numerous that I finally decided to submit the matter to the attorney-general for an opinion. I give herewith the Opinion rendered June 14th by Attorney-General James Bingham:

OPINION.

INDIANAPOLIS, June 14, 1910.

Hon. James Epperson, Inspector of Mines, State House, Indianapolis, Indiana.

Dear Sir—I am in receipt of your letter of June 7th, directing my attention to the provisions of sections eleven and twenty-one of the Act of February 28, 1905 (Acts 1905, p. 65), relating to coal mines, and requesting my opinion as to whether one person may be permitted to perform the duties of mine boss and fire boss at the same time.

Section 11 of said Act, among other things, provides that,

> "Every place where fire damp is known os supposed to exist, shall be carefully examined with a safety lamp by a competent fire boss immediately before each shift."

It is made unlawful for any person to enter any mine generating fire damp until it has been examined by the fire boss and reported by him to be safe, and it is further provided that

> "The operator shall employ a competent mine boss, who shall be an experienced coal miner, and shall keep careful watch over the ventilating apparatus and the air-ways, and shall see that, as the miners advance their excavations, all loose coal, slate and rock overhead are taken down or carefully secured against falling therein on the traveling and airways."

The mine boss by the provisions of section 12 of said Act is required to visit and examine every working place in the mine at least every alternate day while the mine is being worked and to see that each and every working place is properly secured by timbering and that the safety of the mine is assured.

Many other duties are required of the mine boss but all of them seek to render the operation of the mine safe to the workmen. The duties prescribed by the act to be performed by the fire boss have the same purpose in view, namely, to render such mines safe places in which the workmen may perform their labors and are not in conflict with those to be performed by the mine boss.

Section 22 of said act provides that certificates of competency are to be issued by the inspector of mines to persons, upon examinations of qualifications, by experience and technical knowledge, to perform the duties of either mine boss, fire boss or hoisting engineer, and it is made unlawful for any person to serve as a mine boss, fire boss or hoisting engineer until he has received from the inspector the required certificate, and it is unlawful for an operator to employ any persons as mine boss or fire boss who do not hold a proper certificate of competency.

Section 21 of said Act provides that the inspector shall conduct examinations in certain places by which applicants may be examined showing their qualifications entitling them to certificates as prescribed in said Section 22, and it is provided that,

> "No certificate shall be issued to any person entitling him to serve in more than one of the capacities set out in this section, but two or more certificates may be issued to the same person on proper examination."

It is also provided that each applicant for such certificate shall pay to the inspector one dollar for the purpose of paying the expense of holding the examinations.

The language of these sections seems to contemplate that while the inspector of mines may not issue a certificate entitling the holder to serve in more than one of the capacities set out in the section, he may issue to one applicant on a proper examination, two or more certificates. In other words, you may issue to one person a certificate of competency as a mine boss and another one to such person of competency as a fire boss.

In my opinion, upon proper examination you may issue to one person two certificates, one entitling him to serve as mine boss and another entitling him to serve as fire boss, and that there is nothing in the law to prevent the person holding both of the certificates from performing the duties relating to the two positions.

I have the honor to be,

Very truly yours,

JAMES BINGHAM,
Attorney-General.

FATALITIES AND INJURIES TO MINE EMPLOYES.

Under this caption, accidents to mine employes are classed under four separate heads, viz: fatal, permanent, serious and minor, each class being treated separately.

Under the head of fatal accidents we include those where persons were killed outright and those whose injuries proved fatal, death frequently resulting in a few days, weeks or months after the accident occurred.

Under the head of permanent injuries we include those where persons suffered the amputation of a limb, a broken spine or other injury unfitting them to follow their usual occupation.

Under the head of serious accidents we class those resulting in broken or dislocated limbs, internal injuries, cuts, bruises or other injuries causing the person injured any considerable loss of time and of a nature serious enough to call for special mention.

Under the head of minor injuries we include accidents where persons have suffered only slight cuts, bruises or injuries entailing but little loss of time.

In probably three-fourths of the minor accidents no loss of time whatsoever was entailed, the injuries representing a mashed finger, bruised foot or a slight cut. It is necessary, however, that we secure a report of all accidents in and around mines, by reason of the fact that the statute requires this department to investigate all accidents where a physician's attendance is required; also, that frequently what a mine boss on first examination would consider

a seemingly trivial accident, terminates most seriously. In Illinois and other States, only accidents that entail a loss of thirty days' time are reported, and as a result many accidents entailing from three to twelve months, loss are not reported.

The monthly reports of mine bosses, coal companies and reports of inspectors made to this office during the year 1910 show an aggregate of 1,571 accidents to mine employes, classed as follows: Fatal, 51; permanent, 6; serious, 505, and minor, 1,009.

The different causes of each class of these accidents are exhibited in the annexed table:

TABLE

Showing the Number of Fatal, Permanent, Serious and Minor Accidents Occuring in and Around the Coal Mines of Indiana During the Year 1910 and the Different Causes of Such Accidents.

Cause of Accident.	Fatal.	Permanent.	Serious.	Minor.	Total.
Falling coal			62	101	163
Falling slate	25	2	154	190	371
Mine cars	6	1	140	366	513
Mining machines		1	16	21	38
Mine motors			7	14	21
Smoke explosions	2				2
Explosions of powder	3		5	3	11
Explosions of firedamp	4		21	11	36
Premature blasts	5	1	10	1	17
Delayed blasts			5	1	6
Windy shots blowing				1	1
Shots through pillar	1				1
Mine cages	1		4	17	22
Falling down shaft	3			3	6
Kicked by mules			33	92	125
Electric shock	1		1	6	8
Miscellaneous		1	45	171	217
Coal falling down shaft			1	7	8
Railroad cars			1	4	5
Total	51	6	505	1,009	1,571

FATAL ACCIDENTS.

The following summary table of fatal accidents exhibits the date on which each fatality or injury occurred; the name, age and occupation of each person killed or fatally injured; number of dependents left at each death, the cause of each accident; the name of the mine where each accident occurred, and the counties in which the different mines are located:

TABLE.

Summary of Fatal Accidents, 1910.

Date.	Name.	County.	Age.	Cause of Accident.	Mine.	Occupation.	Dependents.		Nationality
							Wife.	Children.	
Jan. 8	Henry Potts	Shot firer	34	Explosion of powder and gases.	Keystone	Sullivan	1	4	English.
Jan. 14	John Hartman	Miner	45	Explosion of powder	Dering No. 6	Vigo			German.
Jan. 17	John Smith	Loader	31	Falling slate	Wabash	Vigo	1		English.
Feb. 17	Chas. Mullinix	Miner	36	Falling slate	Klondyke No. 3	Clay	1	3	American.
Feb. 22	W. A. Pitman	Shot firer	36	Explosion of powder and gases.	Keystone	Sullivan	1	1	American.
Feb. 25	Alex. Rohland	Shot firer	35	Premature blast	Carlisle	Sullivan	1	4	English.
Feb. 28	Jenks Anderson	Miner	45	Explosion of powder	Princeton	Gibson			Negro.
Feb. 28	Frank Jones	Miner	24	Explosion of powder	Princeton	Gibson	1		Negro.
Mar. 7	Tomso Carlevatto	Miner	34	Falling boulder	Crown Hill No. 1	Vermillion	1	2	Italian.
Mar. 11	Sylvester Anderson	Miner	30	Shot through pillar	Union No. 25	Sullivan	1	1	American.
May 13	Sam Roll	Miner	72	Premature blast	Banner	Vanderburgh	1	2	American.
May 13	Robert Thompson	Miner	28	Falling slate	Phoenix	Sullivan			Scotch.
May 21	Pios Clemens	Miner	34	Falling slate	Mandabach	Daviess	1	2	American.
June 2	Geo. Koborn	Loader	24	Falling slate	Vandalia No. 9	Greene			Austrian.
June 7	Walter Watt	Loader	31	Falling slate	Vandalia No. 10	Sullivan			American.
June 12	Nathaniel Melton	Blacksmith	60	Falling down shaft	Parke No. 11	Parke	1	4	American.
June 28	John O'Neal	Miner	60	Falling slate	Princeton	Gibson			Irish.
July 7	James Cox	Loader	41	Falling slate	Peacock No. 2	Pike	1	1	American.
July 13	David Brown	Miner	65	Falling slate	Klondyke No. 3	Clay	1	2	Scotch.
July 13	Fred Delgeman	Timberman	37	Falling rock	Diamond	Vanderburgh	1	2	American.
July 14	D. R. Cowden	Miner	55	Falling slate	Clover Leaf	Sullivan	1		American.
July 15	Victor Johnson	Driver	19	Crushed by mine car	Reliance	Sullivan			American.
July 22	Pat Gallagher	Loader	45	Premature blast	Mammoth	Sullivan			American.
July 25	Carlo Ponti	Miner	45	Premature blast	Superior No. 3	Parke	1	4	Italian.
July 25	Wm. Brummetti	Machine runner	49	Falling slate	Union No. 25	Sullivan	1	6	American.
Aug. 1	Lewis Sanderson	Miner	35	Electrocuted	Glen Ayr No. 2	Vigo	1	4	American.
Aug. 2	David Price	Fire boss	35	Cage hoisted to dump and thrown into shaft	Forrest	Vigo	1	2	American.
Aug. 3	John Skorick	Miner	25	Ascending cage	Dering No. 6	Vigo			Austrian.
Aug. 4	Fred Schrader	Top hand	55	Falling down shaft	Oak Hill No. 1	Vigo	1	2	American.
Aug. 5	Daniel Douilley	Miner	16	Explosion of firedamp	Minshall	Vigo			American.

SUMMARY OF FATAL ACCIDENTS—Continued.

Date.	Name.	Occupation.	Age.	Cause of Accident.	Mine.	County.	Dependents.		Nationality.
							Wife.	Children.	
Aug. 14	John Morten	Driver	24	Crushed by mine car	Vandalia No. 9	Greene		2	American.
Sept. 7	William McNeil	Loader and jerry	46	Falling slate	Knox	Knox	1	2	Scotch.
Sept. 7	Edward Scherer	Jerryman	24	Falling slate	Summitt	Greene	1		American.
Sept. 10	William Stevenson	Asst. gen. supt	37	Falling slate	Shirley Hill No. 1	Sullivan	1	2	American.
Sept. 10	Ross Swinehart	Driver	25	Crushed by mine car	Sugar Valley	Vigo	1		American.
Sept. 10	Frank Miller	Electrician	36	Falling slate	Shirley Hill No. 1	Sullivan	1	5	American.
Sept. 14	Andrew Baxter	Miner	49	Explosion of firedamp	Vandalia No. 10	Sullivan	1	4	Scotch.
Sept. 16	Steve France	Miner	52	Falling slate	Brazil Block No. 9	Parke	1		Slav.
Sept. 20	J. S. Byers	Driver	34	Mine cars	Erie Canal	Warrick	1		American.
Sept. 18	Joseph Brasos	Driver	19	Falling slate	Shirley Hill No. 1	Sullivan			Hungarian.
Sept. 22	Michael Convey	Driver	40	Premature blast	Superior No. 3	Parke			Irish.
Oct. 13	Batiste Perona	Driver	29	Falling slate	Eureka No. 5	Clay	1	2	Italian.
Oct. 21	Ross Nixon	Loader	38	Falling slate	Mammoth	Sullivan	1	2	American.
Oct. 22	John Tobaes	Driver	21	Crushed by mine car	Twin No. 4	Greene	1		French.
Oct. 30	Robert McDaniels	Jerryman	52	Falling coal and slate	Hamilton No. 1	Sullivan	1	2	American.
Nov. 18	Herbert Clark	Loader	18	Falling slate	St. Clair	Sullivan			American.
Nov. 28	Wm. Waugh	Miner	26	Falling rock	Forrest	Vigo	1	3	Negro.
Dec. 1	James Farley	Jerryman	21	Explosion of firedamp	Reliance	Sullivan			American.
Dec. 1	George Ford	Jerryman	21	Explosion of firedamp	Reliance	Sullivan			American.
Dec. 8	Chas. Reed	Driver	22	Falling slate	Deep Vein	Vigo	1	1	American.
Dec. 22	Ross Spice	Car coupler	18	Mine cars and rib	Vandalia No. 8	Greene			American.

TABLE

Showing the Number of Tons of Coal Mined, the Number of Persons Employed, the Number of Fatalities and the Number of Tons of Coal Produced per Each Fatality Each Year from January 1, 1898, to January 1, 1910.

YEAR.	Tons Produced.	Employes.	Fatalities.	Tons per Fatality.
1898	5,146,920	No report.	22	233,950
1899	5,864,975	7,366	15	390,997
1900	6,283,063	8,858	18	349,059
1901	7,019,203	10,296	24	292,466
1902	8,763,197	13,139	24	365,133
1903	9,992,563	15,128	15	181,683
1904	9,872,404	17,838	34	290,304
1905	10,995,972	17,856	47	233,956
1906	11,422,027	19,562	31	368,450
1907	13,250,715	19,009	53	250,013
1908	11,997,304	19,092	45	266,606
1909	13,692,089	18,908	50	273,841
1910	18,125,244	21,171	51	355,397

TABLE OF OCCUPATIONS

Showing the Total Number of Fatal, Permanent and Serious Accidents Occurring in 1910, and the Different Occupations of Persons Fatally or Otherwise Injured.

OCCUPATION.	Fatal.	Permanent.	Serious.	Minor.	Total.
Miners	19	2	129	163	313
Machine runners	1	1	34	38	74
Machine helpers	.....	1	7	20	28
Loaders	7	.....	56	105	168
Motormen	.....	.....	8	11	19
Drivers	9	.....	160	401	570
Roadmen	.....	.....	3	15	18
Jerries	5	.....	46	82	133
Trappers	.....	.....	4	24	28
Cagers	.....	.....	9	51	60
Pumpers	.....	.....	1	1	2
Electricians	2	.....	2	8	12
Trip riders	.....	.....	4	11	15
Car couplers	1	.....	7	10	18
Boss drivers	.....	.....	4	6	10
Mine bosses	.....	.....	5	6	11
Superintendents	1	.....	.....	.....	1
Fire bosses	1	.....	.....	.....	1
Shot firers	3	.....	10	1	14
Flagmen	.....	.....	1	3	4
Engineers	.....	1	.....	5	6
Non-employe	.....	1	.....	.....	1
Shot runner	.....	.....	.....	1	1
Total	51	6	505	1,009	1,571

SERIOUS AND PERMANENT ACCIDENTS.

We give herewith a summary table of the permanent and serious accidents:

TABLE OF PERMANENT ACCIDENTS.

Date.	Name.	Occupation.	Age.	Injury.	Cause of Accident.	Mine.	County.	Dependents.		Nationality.
								Wife.	Children.	
Jan. 27	Edwin James	Machine helper	37	Dislocated hip and bone broken	Falling slate	Parke No. 11	Parke	1	2	American.
Mar. 1	Harry Reynor	Miner	40	Right hand amputated	Falling slate	Dering No. 14	Sullivan			American.
June 10	Guy Robertson	Machine runner	22	Leg amputated	Mining machine	Shirley Hill No. 1	Sullivan			American.
Aug. 8	Clarence Harris	Miner	20	Both legs broken	Exploding shot	Ayrshire No. 4	Pike			American.
Sept. 30	Noble Cozbell	Engineer	23	Left hand amputated	By ax	Sponsler	Greene			American.
Oct. 6	Milton House	Non-employe	14	Right arm amputated	Mine car	Vandalia No. 10	Sullivan			American.

TABLE

Exhibiting the Number of Serious Accidents Occurring in 1910, the Name, Age and Occupation of Persons Injured, the Number of Persons Dependent on them for Support, the Name of County and the Mine Wherein the Accident Occurred.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
Jan. 1	W. A. McConroe	34	Timberman	1			Arm, side, hip, head cut	Falling slate	Reliance	Sullivan.
Jan. 3	Henry Fox	38	Miner	1	2		Bruised back, broken ribs	Falling coal	Riverside	Vigo.
Jan. 3	W. H. Lawson	24	Day man	1	2		Severed two fingers	Door of car	Ray No. 2	Vigo.
Jan. 5	Algie Church	45	Pumper	1			Hand, rib broke, hip bruised	Falling in sump	Glen Ayr No. 2	Vigo.
Jan. 7	W. J. White	32	Machine runner	1	2		Thumb severed	By machine	Green Valley	Greene.
Jan. 8	Harry Rodgers	35	Miner	1	3		Ankle sprained, cut head	Falling slate	North West	Greene.
Jan. 8	Frank Maford	30	Miner	1	2		Dislocated hip	Falling slate	Shirley Hill No. 1	Sullivan.
Jan. 8	Joe Greesick	46	Machine helper	1	3		Broken arm	By machine	Jackson Hill No. 2	Sullivan.
Jan. 11	Harry Shearn	23	Driver				Finger crushed	Mine cars	Little Giant	Sullivan.
Jan. 11	John Barley	31	Driver	1	1		Breast crushed	Car and mule	Atherton	Vigo.
Jan. 12	Isaac Jackson		Bottom cager	1	1		Broken ribs, bruised side		Superior No. 5	Parke.
Jan. 13	John Polonski	37	Car blocker	1	6		Bruised groin and arm	Mine cars	Crown Hill No. 3	Vermillion.
Jan. 14	Frank Bridder	23	Driver				Injured ankle	Coal and mine car	Vandalia No. 8	Greene.
Jan. 14	Irwin Young	44	Driver	1	4		Bruised back and hips	Mine car and prop	Fairview	Parke.
Jan. 15	W. R. Summers	60	Trapper	1			Bruised leg, neck and chin	Mine car	Cannelburg	Daviess.
Jan. 16	Clinton Fray	28	Timberman	1	4		Crushed feet	Falling shale	National Fuel	Vigo.
Jan. 17	John Sedlock	23	Machine runner				Finger severed	Machine	Vandalia No. 69	Vigo.
Jan. 20	O. Morrison	50	Trackman	1	2		Knee dislocated	Falling slate	Klondyke	Vermillion.
Jan. 24	Chas. Sheppard	36	Boss driver	1	2		Arm broken	Kick of mule	Vandalia No. 69	Vigo.
Jan. 24	John Lewis	24	Driver	1			Hip and face cut	Kick of mule	Brazil Block No. 6	Vigo.
Jan. 24	George Ouds	39	Miner	1	4		Bruised shoulder and legs	Falling slate	Forrest	Vigo.
Jan. 25	John Garrison	45	Shooter	1	3		Arms, face and back burned	Shot flame	Brazil Block No. 6	Vermillion.
Jan. 26	Harry Butler	18	Driver				Broken leg	Falling slate	Vandalia No. 9	Greene.
Jan. 27	James Cox	34	Driver	1			Sprained neck, bruised body	Mine cars	Peacock No. 2	Pike.
Jan. 27	Russel Ranis	20	Driver	1			Broken arm	Mine car	Clover Leaf	Sullivan.
Jan. 28	John Brannon	30	Trackman	1	1		Broken arm	Mine car	Greene Valley	Greene.
Jan. 31	John Kendall		Driver	1	1		Hip dislocated, leg bruised	Mine car	Twin No. 5	Greene.
Jan. 31	Andie Crawford	18	Switchman				Arms and finger broken	Mine car trap	Wilfred No. 14	Sullivan.
Feb. 1	Wm. Evans	44	Miner	1	1		Broken leg	Falling slate	Fort Branch	Gibson.
Feb. 2	Aaron Alsep	45	Jerryman	1	5		Face and hands burned	Igniting gas	Vandalia No. 9	Greene.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents. Wife.	Children.	Other Dependents.	Nature of Injury.	Cause of Accident.	Mine.	County.
Feb. 3	John Wilson	21	Miner				Nose cut	Falling slate		Greene.
Feb. 3	Bruce Burke	23	Machine helper	1	3		Leg broken	Falling coal	Tecumseh	Knox.
Feb. 4	Clarence Donaldson	30	Driver	1	4		Broken nose and jaw	Falling from car	Lynn	Knox.
Feb. 4	Winfield Mollette	26	Jerryman	1			Broken arm	Mine car	Blackburn No. 3	Pike.
Feb. 5	William Garrigus	43	Miner	1	1		Crushed foot	Falling slate	Gifford No. 2	Clay.
Feb. 5	John Isaac	24	Driver				Crushed foot	Mine car	Miami No. 4	Vigo.
Feb. 8	Miles Mutchmore	51	Digger	1			Broken arms, bruised hips	Rope broke on incline	Blackburn No. 2	Pike.
Feb. 10	Claude Lurse	30	Driver	1	2		Thumb severed	Mine cars	St. Clair	Sullivan.
Feb. 11	John Saltz	47	Machine man	1	2		Bruised hip and bowels	Falling rock	Rainbow	Sullivan.
Feb. 18	Ota Templeton	20	Driver				Broken arm	Mine car	Sponsler	Greene.
Feb. 21	Clarence Siner	25	Miner				Collar bone broken	Falling slate	Crawford No. 6	Clay.
Feb. 21	Fred King	21	Driver				Broken leg	Mine cars	Vandalia No. 69	Vigo.
Feb. 22	J. C. Rohner	66	Loader	1	3		Broken leg	Falling slate	Vandalia No. 5	Greene.
Feb. 22	A. Fauld	62	Bratticeman	1			Burned head	Burning gas	Reliance	Sullivan.
Feb. 22	Robert Duncan	35	Machine man	1	2		Broken hips, bruised side	Coal	Phoenix	Sullivan.
Feb. 23	David Beasley	35	Loader				Arm and 3 ribs broken	Fall'g ice from shafttipple	Lewis	Clay.
Feb. 23	Dan Amman	21	Driver				Broken leg	Mine cars	Superior No. 4	Clay.
Feb. 24	John Jones	30	Driver	1			Broken ankle	Mine car	Vigo Co. Coal Co.	Vigo.
Feb. 25	Cass Jerrels	60	Loader	1	1		Chest bruised	Falling slate	Vandalia No. 4	Greene.
Feb. 25	Pat Deroyer	21	Driver				Collar bone broken	Blocking car	Vigo Co. Coal Co.	Vigo.
Feb. 25	Enoch O. Oaki	45	Miner				Broken leg	Falling slate	Miami No. 2	Vigo.
Feb. 26	Oscar Autin	26	Tracklayer	1			Nail through foot	Stepped on nail in rail	Vandalia No. 2	Greene.
Feb. 26	Isaac Ryally	36	Tracklayer	1	5		Broken leg	Falling slate	Peacock No. 2	Pike.
Feb. 27	Evert Green	18	Closing trap door				Bruised fingers	Mine car door	Riverside	Vigo.
Feb. 28	Harry Cash	27	Driver	1	2		Two ribs broken, crushed chest	Car and roof	Wabash	Vigo.
Feb. 28	Oliver Tribble	34	Miner	1	7		Bruised back and hips	By cage	Miami No. 6	
Mar. 1	Lemuel Ball	56	Miner	1	6		Bruised back and breast	Falling slate	German	Clay.
Mar. 1	Arch Roll	25	Driver	1			Dislocated hip	Mine car	Oswald	Gibson.
Mar. 1	Jack Ball	24	Miner				Three vertebrae dislocated	Falling slate	German	Clay.
Mar. 3	Thomas Solon	25	Driver				Bruised leg	Kicked by mule	Oswald	Gibson.
Mar. 4	Frank Hong	26	Machine runner	1			Head cut	Rachet	Wabash	Vigo.
Mar. 4	James Suttrs	21	Miner				Finger severed	Lump of coal	Wizard	Clay.
Mar. 7	Robert Blankinship	33	Miner	1	2		Bruised hips and back	Falling slate	Superior No. 5	Parke.
Mar. 8	Joe Seifert	27	Miner	1	1		Strained shoulder and back	Fall of draw slate	North West	Greene.
Mar. 8	J. M. Roberts	17	Miner				Arm broke, leg bruised	Falling slate	Fairview	Parke.
Mar. 8	James Harris	35	Jerryman				Eye hurt	Falling slate	Consol. Ind. No. 33	Sullivan.

Mar.	8	James Luttrull	45	Miner	1			Side, foot, ankle bruised	Falling slate	Winslow	Pike.
Mar.	8	Phillip Hayworth	22	Car dropper				Crushed hand	Car	Hocking	Sullivan.
Mar.	8	Homer Wilks	36	Machine helper	1	1		Bruised hips	Mine car	Vandalia No. 10	Sullivan.
Mar.	10	John Robinson		Loader				Two ribs broken	Falling coal	Vandalia No. 10	Sullivan.
Mar.	11	Wm. Sehlatter	28	Miner	1			Face, arms, body burned	Explosion of powder	Miami No. 2	Vigo.
Mar.	12	James Patrick	33	Motorman	1	1		Right leg cut	Mine car and motor	Glen Ayr No. 1	Vigo.
Mar.	12	Thos. Hoffman	19	Driver				Thumb severed	Sprag and wheel	Vandalia No. 10	Greene.
Mar.	16	Neut Synader	24	Miner			1	Right leg broken	Falling slate	North West	Greene.
Mar.	16	Frank Gibner	34	Driver				Broken arm	Mine car	Oswald	Gibson.
Mar.	18	Thomas Sgle	33	Tracklayer		2		Bruised back	Falling coal	Crown Hill No. 1	Vermillion.
Mar.	18	Vergil Moore	24	Miner	1	1		Bruised chest and back	Falling coal	Miami No. 4	Vigo.
Mar.	19	Selby Potter	23	Driver				Mashed hand	Car and roof	Green Valley	Greene.
Mar.	19	Arthur Wright	27	Miner				Bruised foot and ankle	Falling slate	St. Clair No. 30	Sullivan.
Mar.	19	Silas Wagner	26	Driver	1			Bruised head, hip and leg	Striking head on rock	Lower Vein	Vigo.
Mar.	21	John Lawson	20	Miner				Bruised chin and back	Falling slate	Miami No. 4	Vigo.
Mar.	23	Howden Riggs	17	Trip rider				Squeezed in abdomen	Mine car	Vandalia No. 9	Greene.
Mar.	24	Ed. Cunningham	25	Driver				Broken arm	Mine car	Vandalia No. 2	Greene.
Mar.	25	Perry Altman	65	Miner	1			Cut over eye	Piece of slate	Crawford No. 6	Clay.
Mar.	25	Merrit Holson	20	Driver				Bruised arm	Mule kick	Vandalia No. 4	Greene.
Mar.	26	Dan Smith	35	Miner	1	3		Broken foot	Falling coal	Caledonia	Warrick.
Mar.	28	Leonard Rankin	46	Water hauler	1			Bruised ankle	Water box and switch	Brazil Block No. 14	Sullivan.
Mar.	29	William Russel	30	Loader	1			Crushed foot	Falling coal	Consol. Ind. No. 14	Sullivan.
Mar.	31	Sears Hulen	34	Miner	1			Arms, neck and shoulder burned	Igniting some gas	Oswald	Greene.
Mar.	31	John Witmarch	24	Driver				Bruised side and back	Mine car and mule	Miami No. 5	Vigo.
April	28	Harvey Gibson	36	Machine helper	1	4		Shoulder and foot dislocated	Falling slate	Domestic Block No.1	Vigo.
April	30	E. E. Norton	50	top hand	1	4		Finger severed	Lump of coal	Clover Leaf	Sullivan.
May	5	Wm. Vaughn	26	Driver				Bruised hips and abdomen	Mine cars	Vandalia No. 5	Greene.
May	5	Osa Burrell	18	Top man				Finger severed	Mine car	Shirley Hill No. 1	Sullivan.
May	6	Lee Kote	53	Slate man	1			Head and leg cut	Falling slate	North West	Greene.
May	6	Andy Vindiski	26	Loader				Crushed back and side	Falling coal	Tecumseh	Knox.
May	7	Wm. Maxwell		Machine runner				Squeezed hips and legs	Falling coal	Vandalia No. 9	Greene.
May	7	Alvie Leonard	34	Boss driver		3		Crushed in abdomen and leg	Kicked by mule	Freeman	Knox.
May	7	Geo. Swift	30	Machine helper	1		3	Crushed foot	Falling coal	St. Clair	Sullivan.
May	7	Chas. Owens	22	Driver	1	1		Bruised leg and ankle	Mine car	Lower Vein	Vigo.
May	9	Fred Osborne	22	Asst. motorman				Hand crushed	Motors	Vandalia No. 10	Sullivan.
May	10	James Scott	19	Driver	1			Bruised and cut leg	Mine car	Knox	Knox.
May	10	Van Lambert	30	Miner	1	3		Two ribs broken	Falling slate	Miami No. 4	Vigo.
May	10	Archie McDonald	24	Driver				Fractured shoulder	Mine car	Wabash	Vigo.
May	12	Albert Short	25	Loader	1	4		Broken leg	Going back on shot	Tecumseh	Knox.
May	12	James Killiman	26	Driver	1	2		Broken arm	Mine cars	Vandalia No. 67	Vigo.
May	12	James Gallion	21	Day man	1	1		Crushed in abdomen	Kick of mule	Vandalia No. 69	Vigo.
May	13	Robert Tompson	27	Timberman				Bruised body	Falling slate	Phoenix	Sullivan.
May	14	Mart. McLaney	26	Driver				Jaw bone broke	By mule	St. Clair	Sullivan.
May	14	William Smiley	19	Driver				Collar bone broken	Mule kick	Hocking	Sullivan.
May	14	Lee Richardson	30	Room boss	1			Collar bone, 2 ribs broke	Falling slate	Brazil Block No. 8	Vermillion.
May	14	Samuel Howell	35	Miner	1	3		Back and hips bruised	Falling slate	Brazil Block No. 8	Vermillion.
May	15	Scott McMahon	27	Machine helper	1			Bruised limbs and abdomen	Falling coal	Island Valley No. 4	Clay.
May	17	James Patrick	33	Motorman	1	1		Crushed leg	Mine cars and motor	Glen Ayr No. 1	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
May 17	Thomas Jameson	30	Driver	1	....	....	Bruised arm	Trap door and car	Glen Ayr No. 2	Vigo.
May 18	Frank Mullis	48	Boss driver and pumper	1	1	....	Two ribs broken	Mule and mine car	Twin No. 5	Greene.
May 19	Frank Criss	32	Machine runner	1	1	....	Back and hips bruised	Mine car and timber	Consol. Ind. No. 33	Sullivan.
May 20	Elmer Cety	30	Miner	1	....	....	Face and hand burned	Exploding shot and gas	Pittsburg	Vigo.
May 20	Wm. Fennent	27	Driver	....	....	....	Three ribs broken	Mine car	Wabash	Vigo.
May 20	Joe Anderson	33	Shot firer	....	....	....	Face cut, arm bruised	Exploding shot	Riverside	Vigo.
May 20	Otto Sersott	21	Driver	....	....	1	Hip bruised, broken rib	Falling slate	Elberfeld	Warwick.
May 21	Wm. Jackson	20	Driver	....	....	....	Broken arm	Mine cars	Lincoln	Parke.
May 23	Chas. McDaniels	34	Engineer	1	....	....	Bruised arm	By falling	Lewis	Clay.
May 23	Bert Davis	28	Cager	1	....	....	Crushed hips	Mine cars	Summit	Greene.
May 24	Wm. Peake	58	Loader	1	....	....	Fractured knee cap	Falling slate	Queen	Greene.
May 25	Richard Cox	23	Top boss	....	....	....	Crushed hips	Railroad cars	Tecumseh	Knox.
May 25	C. Fields	17	Driver	....	....	1	Hip bruised, rupture	Mine car	Knox	Knox.
May 26	James Glass	31	Miner	....	....	1	Leg broken	Falling coal	Superior No. 5	Parke.
May 26	John Frantrick	44	Miner	1	4	....	Back and hips bruised	Falling slate	Crown Hill No. 3	Vermillion.
May 27	Sella Momande	35	Miner	....	....	....	Head, arm, hand burned	Igniting some gas	Klondyke	Vermillion.
May 27	Jack Winterbottom	24	Driver	....	....	....	Head and hand burned	Gas explosion	Klondyke	Vermillion.
May 28	Charles Love	60	Trapper	1	....	....	Arm broken	Mine car	Crawford No. 6	Clay.
May 28	Robert Bohnert	22	Motorman	....	....	....	Body bruised	Motor and mine car	Gilmour	Greene.
May 28	George Greek	24	Driver	....	....	....	Crushed hand	Falling slate	Hocking	Sullivan.
May 28	Pete Suller	37	Day man	1	4	....	Bruised back and shoulder	Falling slate	Atherton	Vigo.
May 31	Wm. Barnes	42	Loader	1	6	....	Head cut, ankle sprain	Falling slate	Lattas Creek	Greene.
May 31	Evert Nichols	25	Loader	....	....	....	Wrist broken	Mine cars	Vandalia No. 21	Greene.
May 31	Geo. Cerlyole	30	Miner	1	1	....	Bruised arm	Pick point	Clover Leaf	Sullivan.
June 1	James Bundy	19	Driver	....	....	....	Lost 5 teeth, face cut	Mule kick	National Fuel	Vigo.
June 1	Teddy Black	38	Miner	1	....	....	Legs hurt	Cage	Buckeye	Vermillion.
June 2	James Baker	21	Driver	....	....	....	Side and back squeezed	Car and rib	Crown Hill No. 3	Vermillion.
June 2	Herman Kennedy	20	Loader	....	....	....	Finger severed	Car and rail	Vivian No. 2	Clay.
June 2	John Oneal	28	Loader	1	....	....	Bruised leg	Car	Freeman	Knox.
June 3	John Venman	21	Miner	....	....	....	Broken arm	Motor and roof	Vandalia No. 69	Vigo.
June 4	C. Baine	24	Driver	....	....	....	Broken leg	Car and chain	Klondyke	Vermillion.
June 4	Claude Taylor	27	Driver	....	....	....	Leg and arm bruised	Mine car	Klondyke	Vermillion.
June 4	John Goddard	21	Driver	....	....	1	Jaw fractured, face cut	Mule kick	Lincoln	Parke.
June 6	John Williams	18	Machine	....	....	....	Finger crushed	Machine	Grant No. 3	Vigo.
June 6	John Jones	21	Driver	1	1	....	Hip dislocated	Ran into a fall	Plymouth No. 1	Vigo.

June	6	R. McCrea	23	Driver				Back squeezed	Mule and car	Crown Hill No. 1	Vermillion.
June	6	Harry Johnson	23	Driver				Arm broken	Cars	Miami No. 4	Vigo.
June	8	Phillip August	33	Miner	1			Back strained	Falling slate	National	Vigo.
June	8	L. A. Pennic	51	Miner	1	1		Collar bone fracture	Falling slate	Glenburn	Greene.
June	8	John Wright	28	Timberman	1	2		Hips mashed	Falling slate	Jackson Hill No. 4	Sullivan.
June	8	Chas. Wheeler	18	Loader				Hips and back squeezed	Falling slate	Vandalia No. 10	Sullivan.
June	9	J. G. Turpen	38	Boss jerry	1	4		Arm bruised	Falling slate	Fort Branch	Gibson.
June	9	Dan Ellison	46	Miner		4		Head cut, ankle sprain	Falling slate	Little Giant	Sullivan.
June	10	Andrew Smith	32	Day man				Broken wrist	Falling slate	Plymouth No. 1	Vigo.
June	10	Guy Robertson	22	Machine				Leg cut	Machine	Shirley Hill No. 1	Sullivan.
June	10	Clarence Call	19	Driver				Foot bruised	Mule	Crown Hill No. 1	Vermillion.
June	10	John Everhart	23	Driver				Foot mashed	Mine car	Consol. Ind. No. 32	Sullivan.
June	10	Emert McClellan	19	Motorman				Head cut and bruised	Falling slate	Crown Hill No. 1	Vermillion.
June	11	William Drake	60	Driver	1			Leg and back strained	Falling slate	Vandalia No. 4	Greene.
June	11	John McKaine	40	Machine	1	3		Hip cut and bruised	Machine and chain	Erie Canal	Warrick.
June	12	Neal Snider	45	Jerry	1			Crushed hips	Falling slate	Jackson Hill No. 4	Sullivan.
June	13	Ezule Holden	68	Day man	1			Rib broken, head cut	Falling slate	Superior No. 2	Parke.
June	13	James Conningham	18	Driver				Two ribs fractured	Mine car	Glen Ayr No. 1	Vigo.
June	13	John Buchanan	40	Loader	1	1		Back sprained	Falling slate	Hocking	Sullivan.
June	13	David Walton	29	Miner	1	3		Back and hips bruised	Falling prop	Otter Creek No. 2	Vigo.
June	14	George Truitt	29	Machine	1	3		Back sprained	Machine	Hocking	Sullivan.
June	14	James Cunningham	18	Driver				Two ribs fractured	Car	Glen Ayr No. 1	Vigo.
June	14	Lewis Emery	29	Miner	1	1		Leg broken	Falling slate	Vandalia No. 67	Vigo.
June	15	Ollie McCrocklin	27	Driver	1	1		Bones in leg fractured	Mine car	Consol. Ind. No. 30	Sullivan.
June	15	William Keller	35	Miner	1	3		Hips wrenched	Car	Clover Leaf	Sullivan.
June	15	William Bryan	58	Miner	1			Hand cut and bruised	Falling slate	Kelley	Sullivan.
June	16	Frank Berg	28	Machine				Finger broken	Clutch shaft	Mammoth Vein	Sullivan.
June	16	George Briddle	32	Machine	1	1		Head and chest bruised	Falling slate	Plymouth No. 1	Vigo.
June	16	Wm. Brannon	21	Driver				Foot bruised	Car	Forrest	Vigo.
June	18	Wm. Wilks	26	Driver				Head bruised	Falling slate	Vandalia No. 8	Greene.
June	18	Joe Povlick	24	Machine				Head squeezed	Motor	Vandalia No. 9	Greene.
June	18	Otto Wilson	25	Loader	1			Eye ball bruised	Coal	Hocking	Sullivan.
June	19	Osten More	25	Driver				Hips and back mashed	Falling slate	Jackson Hill No. 2	Sullivan.
June	19	T. A. Williams	23	Driver				Arm broken	Mule and car	Mammoth Vein	Sullivan.
June	20	Guy Hudson	20	Driver				Hips squeezed	Car and prop	Clover Leaf	Sullivan.
June	20	Ora Parks	33	Driver	1	4		Fractured skull, leg hurt	Car and mule	Vandalia No. 10	Sullivan.
June	20	Abner Bose	36	Electrician	1	2		Back wrenched	Machine	Consol. Ind. No. 33	Sullivan.
June	20	Frank Harmon	50	Timberman	1	2		Bone in foot broken	Prop	Consol. Ind. No. 33	Sullivan.
June	20	Thos. Armstrong	22	Driver				Hips squeezed	Mule and car	Vandalia No. 8	Greene.
June	20	Joe Scout	52	Driver				Ankle dislocated	Bumper and car	Gilmour	Greene.
June	20	Wm. Wilks	50	Miner	1	7		Head and hand burned	Gas	Kelley	Sullivan.
June	21	Henry Butler	19	Loader	1			Nose broken	Piece of coal	Consol. Ind. No. 33	Sullivan.
June	21	Lou Kitter	26	Jerry	1	1		Hips crushed	Falling slate	St. Clair No. 30	Sullivan.
June	21	Nicholas McGlawson	32	Driver				Leg broken	Mule and cars	Ray No. 2	Vigo.
June	21	Ezekil Holden	68	Carpenter	1			Two ribs broken	Falling slate	Zellar McClellan	Parke.
June	22	Chas. Campbell	25	Miner	1	2		Legs hurt	Coal	Zellar McClellan No. 3	Parke.
June	22	Ande Maxwell	25	Coupler	1			Hip bruised	Cars	Crown Hill No. 1	Vermillion.
June	22	Joseph Kay	19	Machine				Back and ribs bruised	Falling slate	Domestic Block	Vigo.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
June 23	Ray Snider	22	Shooter	1	2	....	Leg cut and bruised	Falling coal	Bellevue	Sullivan.
June 24	Cabel Conger	27	Machine	1	....	....	Seven ribs broken	Falling slate	St. Clair No. 30	Sullivan.
June 24	Alfred Cowelier	24	Driver	....	....	....	Hip bruised	Car	Vandalia No. 5	Greene.
June 24	William Lowes	23	Driver	....	....	....	Foot bruised	Car	Green Valley	Greene.
June 24	Merle Scott	22	Top man	....	....	....	Heel severed, foot hurt	Car	Twin No. 5	Greene.
June 25	Harvie Stopelton	40	Driver	....	....	....	Back sprained	Falling slate	Pittsburg No. 1	Vigo.
June 27	Martin Montgomery	61	Miner	....	....	2	Leg and ankle bruised	Cars	Plymouth No. 1	Vigo.
June 27	Frank Compton	....	Driver	....	....	....	Finger broken	Mule kick	Pittsburg No. 1	Vigo.
June 27	Leon Vaugh	21	Driver	....	....	....	Foot cut and bruised	Tail chain	Big Vein	Clay.
June 27	Geo. Baker	19	Loader	....	....	....	Wrist dislocated	Car	Vandalia No. 20	Sullivan.
June 28	Harry Gordon	46	Miner	....	....	....	Back hurt	Falling slate	Zellar McClellan No.1	Parke.
June 28	Harry Wright	23	Loader	1	....	....	Ankle dislocated	Falling slate	Parke No. 11	Parke.
June 28	Wm. Waldridge	27	Miner	1	2	....	Ankle cut and bruised	Falling slate	Big Vein	Clay.
June 29	Leonard Prulhier	38	Miner	1	6	....	Leg broken	Falling slate	Miami No. 5	Vigo.
June 29	Wm. Sneddon	63	Pumpman	1	4	....	Two fingers severed	Falling pipe	Vandalia No. 67	Vigo.
July 2	Lawrence Byers	34	Machine	1	4	....	Toe severed	Skid fell on foot	Minshall	Vigo.
July 5	Fred Wood	27	Driver	1	2	....	Body bruised	Mine car	Minshall	Vigo.
July 6	J. H. Rice	....	Loader	1	4	....	Foot bruised	Falling coal	Gilmour	Greene.
July 6	Thomas K. Jones	43	Loader	....	3	....	Two ribs broken	Falling coal	Vandalia No. 10	Sullivan.
July 6	D. E. Boone	30	Loader	1	2	....	Back and hips crushed	Falling slate	Vandalia No. 10	Sullivan.
July 6	John Ruthford	28	Driver	....	....	....	Hand and foot broken	Falling slate	Vandalia No. 10	Sullivan.
July 6	Thomas Reese	33	Day man	....	....	....	Cut over eye	Falling slate	Crown Hill No. 3	Vermillion.
July 6	L. M. Roberts	51	Timberman	1	6	....	Head cut and ankle sprained	Falling slate	Freeman	Knox.
July 7	James Cox	41	Loader	1	1	....	Sprained back	Falling slate	Peacock No. 2	Pike.
July 7	C. M. Collum	49	Miner	1	....	....	Ankle bone broken	Falling slate	Little Giant	Sullivan.
July 8	Richard Braila	45	Timberman	1	1	....	Bruised foot	Falling slate	Clover Leaf	Sullivan.
July 8	H. D. Gage	35	Night boss	1	3	....	Dislocated hip	Mine cage	Consol. Ind. No. 33	Sullivan.
July 8	R. Gibbons	30	Driver	1	....	....	Two ribs broken	By mule	Oak Hill No. 50	Vermillion.
July 9	Gladstone Smith	17	Car coupler	....	....	....	Foot fractured	Mine car	Vandalia No. 10	Sullivan.
July 9	Wm. Smith	20	Driver	....	....	....	Bruised back and fractured hip	Falling rock	Rainbow	Sullivan.
July 11	James Swalla	20	Driver	1	....	....	Broken arm	Mine car	Glen Ayr No. 1	Vigo.
July 12	F. P. Osborn	27	Driver	1	2	....	Bruised breast	Mule kick	Vandalia No. 81	Vigo.
July 13	James Varner	55	Loader	1	2	....	Broken arm	Falling slate	Little Giant	Sullivan.
July 13	James Van Hook	60	Tracklayer	1	2	....	Broken hand	Falling slate	Minshall	Vigo.
July 15	Walter Kreible	25	Miner	1	1	....	Bruised back	Falling coal	Island Valley No. 4	Clay.
July 16	Oscar Carter	48	Loader	1	2	....	Head and chest cut, 3 ribs br'k'n	Falling slate	Union No. 25	Sullivan.

July	18	Joseph Stout	52	Driver	1			Collar bone broken	Mine car	Gilmour	Greene.
July	19	Oscar Ridgley	26	Trap man	1			Crushed hips	Mine cars	Vandalia No. 8	Greene.
July	21	Herod Albert	30	Loader	1	3		Crushed foot	Piece of coal	Vandalia No. 9	Greene.
July	21	John Pontonick	35	Miner	1	1		Burned on back and hand	Igniting gas	Little Giant	Sullivan.
July	21	Alexander Osbura	23	Timberman				Bruised back and shoulder	Falling slate	Mammoth	Sullivan.
July	22	Pat. Gallagher	45	Loader				Head and face cut	Exploding shot	Mammoth	Sullivan.
July	22	Chas. Hockett	22	Driver	1	2		Thumb severed	Car wheel and sprag	Brazil Block No. 13	Sullivan.
July	23	Herman Storry	27	Miner				Bruised arm and hip	Falling slate		Sullivan.
July	23	Valentine Bollinio	38	Loader				Bruised head	Falling slate	Crown Hill No. 3	Vermillion.
July	23	Peter Fay	44	Miner	1	5		Broken rib	Falling down shaft	Vandalia No. 61	Vigo.
July	23	George Overpeck	18	Miner				Rupture	Lifting coal	Plymouth No. 1	Vigo.
July	25	F. Giuldenbacher		Day man				Leg broken	Falling slate	Parke No. 11	Parke.
July	25	James Dix	35	Machine runner	1	2		Bruised head and breast	Falling slate	Phoenix	Sullivan.
July	25	James Farmer	32	Loader				Broken leg	Falling slate	Union No. 25	Sullivan.
July	26	Hugh Dobbins	28	Day man	1	2		Crushed bone in knee	Falling slate	Twin No. 4	Greene.
July	26	Oscar Dunning	22	Driver	1			Broken nose	Falling off car	Shirley Hill No. 3	Sullivan.
July	27	Samuel Hawkins	60	Miner	1			Shoulder and breast bruised	Falling slate	Crawford No. 10	Clay.
July	27	Andy York	17	Coupler				Arm broken	Mine cars	Vandalia No. 66	Vigo.
July	28	Arthur Brush	20	Miner				Bruised back	Falling slate	Domestic Block No.1	Vigo.
July	29	John Robetson	42	Loader	1	8		Crushed hips	Falling slate	Vandalia No. 10	Sullivan.
July	30	Mel Osodooek	40	Miner				Bruised arm and leg	Falling slate	Klondyke	Vermillion.
July	31	Chas. Brewer	41	Jerry	1	1		Broken arm	Falling slate	Little Giant	Sullivan.
Aug.	2	John Miller	47	Loader	1	7		Back and leg crushed	Falling slate	Tecumseh	Knox.
Aug.	4	George Kelley	34	Miner	1			Hands and face burned	Powder explosion	Letsinger	Greene.
Aug.	4	Swan Eck		Miner				Back and side injured	Falling slate	Superior No. 5	Pike.
Aug.	5	Walter Bridgas	19	Driver				Leg cut, ankle sprained	Mine car	Island Valley No. 4	Clay.
Aug.	5	Jesse Hill	55	Loader	1	6		Arm and hip bruised	Falling slate	Knox	Knox.
Aug.	5	Joseph Bouillez	28	Miner	1			Head, back and arms burned	Explosion of gas	Minshall	Vigo.
Aug.	5	Daniel Bouilley	16	Miner				Hands, arms, face burned	Explosion of gas	Minshall	Vigo.
Aug.	6	Harry Spencer	26	Sprager	1	3		Crushed ankle	Mine car	Miami No. 4	Vigo.
Aug.	6	Joe Tempks	55	Miner				Bruised body	Falling slate	Minshall	Vigo.
Aug.	7	Chas. Dixon	66	Rais'g smoke st'k	1	2		Broken leg	Falling jin pole	Island Valley No. 4	Clay.
Aug.	8	Wm. Zimmerman	20	Trip rider				Crushed arm and finger	Mine motor	Island Valley No. 4	Clay.
Aug.	8	Thomas Pringle	29	Miner	1	2		Crushed foot	Falling slate	Shirley Hill No. 3	Sullivan.
Aug.	8	Henry Shultz	27	Cager	1			Hand broken	Coal falling down shaft	Dering No. 13	Sullivan.
Aug.	8	Simon Pometlo	24	Miner				Injured back	Falling slate	Crown Hill	Vermillion.
Aug.	9	Joseph Wright	36	Miner	1	2		Dislocated back	Falling slate	Lewis	Clay.
Aug.	10	Mike Colletto	50	Miner	1	2		Finger severed	Falling coal	Superior No. 5	Parke.
Aug.	10	George Scokum	53	Miner	1	1		Bruised knee	Falling coal	Superior No. 5	Parke.
Aug.	10	Joseph Melchaw		Miner	1	3		Mashed leg	Falling coal	Superior No. 5	Parke.
Aug.	10	Bert Lowe	20	Boss driver				Jaw bone and 3 ribs broken	Falling slate	Forrest	Vigo.
Aug.	11	Allen Petrei	27	Driver	1	2		Two bones broken in foot	Mine cars	Lower Vein	Vigo.
Aug.	13	Chas. Faught	31	Loader	1			Ribs and back bruised	Falling rock	Union No. 25	Sullivan.
Aug.	13	Dock Fyne	22	Driver				Rib broken	Mine car	Crown Hill No. 3	Vermillion.
Aug.	15	A. Cloushude	31	Miner	1	2		Arm broken	Falling slate	Vandalia No. 9	Greene.
Aug.	15	Roy Lewis	14	Trapper				Three fingers mashed	Mine car	Tecumseh	Knox.
Aug.	15	Chas. McAdams	27	Loader				Both legs broken	Falling slate	Mammoth Vein	Sullivan.
Aug.	15	Turkey Tuzette	36	Loader	1	1		Leg and arm cut	Falling coal	Crown Hill No. 3	Vermillion.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
Aug. 15	Boris Braunon	60	Tracklayer	1	1	....	Hands and face burned	Igniting some gas	Minshall	Vigo.
Aug. 16	Henry Dierdorf	37	Miner	1	3	....	Head, side and hips bruised	Falling slate	Crawford No. 6	Clay.
Aug. 16	Arthur Auberry	32	Machine runner	1	1	....	Broken leg	Falling slate	Vandalia No. 8	Greene.
Aug. 16	Clyde Horbon	26	Loader	1	2	....	Broken leg	Falling slate	Summitt	Greene.
Aug. 18	J. W. Bush	44	Miner	1	....	....	Bruised body	....	Oswald	Gibson.
Aug. 18	Jerry Starrett	....	Miner	1	4	....	Bruised hip and back	Falling coal	Superior No. 5	Parke.
Aug. 18	Tona Mick	....	Miner	1	1	....	Mashed ankle and foot	Falling coal	Superior No. 5	Parke.
Aug. 20	A. W. Watson	34	Machine runner	1	....	....	Broken foot	Mining machine	Vandalia No. 10	Sullivan.
Aug. 21	Wm. Veach	....	Driver	1	1	....	Finger severed	Mine car	Lewis	Clay.
Aug. 22	John Jerman	21	Driver	....	....	....	Two ribs broken	Mule kick	Vandalia No. 20	Greene.
Aug. 22	Earl Howard	20	Bottom hand	....	....	....	Finger severed	Mine cars	Freeman	Knox.
Aug. 22	John Cabbage	46	Day man	1	2	....	Bruised back and legs	Falling slate	Superior No. 3	Parke.
Aug. 22	Frank Compton	30	Driver	1	....	....	Face and hands burned	Exploding shot	Pittsburg	Vigo.
Aug. 22	Seth Blue	30	Miner	1	....	....	Face and hands burned	Exploding shot	Pittsburg	Vigo.
Aug. 23	John Myres	32	Cager	1	3	....	Back and arm squeezed	Mine car	Tecumseh	Knox.
Aug. 24	Horace Neal	19	Driver	....	....	....	Bruised hips	Mine car	Vandalia No. 9	Greene.
Aug. 24	Orval Skinner	17	Driver	1	....	....	Broken leg, ankle dislocated	Falling slate	Gilmour	Greene.
Aug. 26	Howard Taylor	25	Driver	1	1	....	Broken hand	By mule	Vandalia No. 5	Greene.
Aug. 26	Joe Paelken	20	Driver	....	....	....	Broken leg	Mine car	Freeman	Knox.
Aug. 27	Fred Down	22	Driver	....	....	....	....	Mine cars	Phoenix	Sullivan.
Aug. 27	John McDonald	23	Cager	1	1	....	Head and wrist cut	Falling coal	Rainbow	Sullivan.
Aug. 27	Van White	19	Driver	....	....	....	Back and shoulder bruised	Falling slate	Brazil Block No. 14	Sullivan.
Aug. 27	Frank Gunter	55	Mine boss	1	....	....	Three ribs broken	Falling rock	Banner	Vanderburgh.
Aug. 27	Chas. Barrel	22	Driver	....	....	....	Bruised chest and leg	Mine car	Glen Ayr No. 1	Vigo.
Aug. 28	John Scott	30	Driver	1	3	....	Ruptured	Mule kick	Electric	Warrick.
Aug. 29	Earl Woodruff	....	Miner	....	....	....	Bruised back	Falling coal	Lewis	Clay.
Aug. 29	Felix Osborn	41	Miner	1	....	....	Bruised leg and shoulder	Falling coal	Oswald	Gibson.
Aug. 29	Ech Orukey	18	Driver	....	....	2	Bruised back	Falling slate	Superior No. 3	Parke.
Aug. 30	P. F. Hawkins	50	Loader	....	....	1	Bruised hip and ankle	Falling rock	Rainbow	Sullivan.
Aug. 30	J. J. Brodie	63	Crattrie man	1	....	....	Dislocated shoulder	Mine car	Consol. Ind. No. 32	Sullivan.
Aug. 30	John Albentine	37	Machine runner	1	1	....	Bruised back	Falling slate	Crown Hill No. 3	Vermillion.
Aug. 30	Claude Anderson	28	Driver	1	....	....	Face, shoulder and back cut	Falling slate	Forrest	Vigo.
Aug. 31	Ed. Auberry	66	Loader	1	8	....	Head, shoulder and leg cut	Falling slate	Vandalia No. 8	Greene.
Aug. 31	Isaac Corica	37	Miner	....	....	....	Broken leg	Falling slate	Ray No. 2	Vigo.
Sept. 2	Alber Necole	....	Day man	1	2	....	Bruised shoulder	Falling slate	Zellar McClellan No.5	Parke.
Sept. 2	Wm. Baldon	57	Miner	....	3	....	Leg broken, body bruised	Going back on shot	Little Giant	Sullivan.

Sept.	3	Baxter Bare	19	Motorman			Head cut	Mine motor	Gilmour	Greene.
Sept.	6	Wm. Geser	26	Driver	1	2	Bone broken in arm	Low place in roof	Erie Canal	Warrick.
Sept.	6	Richard Oats	18	Driver			Squeezed hips and ruptured	Mine car	Forrest	Vigo.
Sept.	6	Wm. Jukes	40	Shoveler	1	2	Ankle fractured	Mine machine	Parke No. 12	Parke.
Sept.	6	Edward Howard	47	Cutting a wire	1	1	3 ribs broken, shoulder bruised	Falling from a pole	Zellar McClellan No. 2	Parke.
Sept.	6	Wm. Easton	35	Jerry			Bruised back, finger broken	Falling slate	Knox	Knox.
Sept.	6	Pearce Brown	30	Driver			Injured internally	Loading some oil	Freeman	Knox.
Sept.	6	Geo. Fitspatrie	32	Miner	1	3	Bruised back and leg	Falling slate	Glen Burn	Greene.
Sept.	7	Thomas Shore	28	Loader	1		Bruised back and hips	Falling slate	Vandalia No. 10	Sullivan.
Sept.	7	Wm. McQuillen	36	Machine	1	2	Fractured rib	Falling prop	Rainbow	Sullivan.
Sept.	7	Stem Kendall	28	Miner	1		Bruised leg	Falling coal	Pittsburg No. 1	Vigo.
Sept.	8	John Clinton	16	Driver			Left groin bruised	Mine door and car	Crown Hill No. 3	Vermillion.
Sept.	8	Frank Lovelers	26	Driver	1	2	Fractured ribs	Mule kick	Littles, Ind	Pike.
Sept.	8	Edgar Kences	30	Miner			Body burned	Powder burning	Twin No. 5	Greene.
Sept.	9	Ben Letinger	21	Driver			Finger severed	Tail chain and car	Vivian No. 2	Clay.
Sept.	9	John Gillen	24	Driver	1		Bruised leg	Car and prop	Freeman	Knox.
Sept.	9	Doinick Basse	22	Miner			Back injured	Falling slate	Crown Hill No. 3	Vermillion.
Sept.	10	Ross Swinehart	25	Driver	1		Broken leg	Mine car	Sugar Valley	Vigo.
Sept.	12	John Boermreg	24	Miner			Broken leg	Falling slate	Klondyke	Vermillion.
Sept.	12	Oar Holt	23	Shooter			Head and hand cut	A shot	Buckeye	Vermillion.
Sept.	13	James Schearn	32	Machine			Back and shoulder bruised	Falling slate	Wabash	Vigo.
Sept.	13	Guy Rawley	17	Miner			Arm broken	Mine car	Crown Hill No. 3	Vermillion.
Sept.	13	Charles Phillips	45	Miner	1		Back and shoulder sprained	Falling slate	Keystone	Sullivan.
Sept.	14	Bert Reese	21	Miner			Skull fractured	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	Dan Ferguson	26	Miner			Neck and arm burned	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	W. C. Beatty	40	Miner			Hand and face burned	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	Charles Young	21	Miner	1		Hand and face burned	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	James Baxter	21	Miner			Arm broken	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	Wm. Celland	26	Day man				Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	David Houston	53	Miner	1	3	Hand and arm burned	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	George Ross	25	Miner			Face burned, leg cut	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	Ora Parks	32	Driver	1	4	Face and hands burned	Explosion of gas	Vandalia No. 10	Sullivan.
Sept.	14	Vincent Pelossa	27	Loader			Back cut and bruised	Falling coal	Crown Hill No. 3	Vermillion.
Sept.	16	Howard Taylor	23	Driver	1		Fractured rib	Mule	Vandalia No. 5	Greene.
Sept.	17	Leslie Reynolds	24	Driver	1	1	Finger broken	Falling	Wizard	Clay.
Sept.	17	Laurel Welch	17	Loader			Toe cut	Falling coal	Phoenix	Sullivan.
Sept.	19	Lon. Marlow	40	Loader	1	6	Ankle bruised	Falling slate	Phoenix	Sullivan.
Sept.	20	Plaz. Jones	40	Machine	1	2	Left hand cut	Machine	Sunflower	Sullivan.
Sept.	20	Dayton Frazier	45	Loader	1	1	Mashed hand	Falling slate	Freeman	Knox.
Sept.	20	Eli Fielding	56	Miner	1	5	Hand and back bruised	Falling slate	Eureka No. 5	Clay.
Sept.	21	Paul Adams	19	Driver			Bone in arm broken	Tail chain	Phoenix	Sullivan.
Sept.	21	Wm. Reese	44	Loader			Bone in leg broken	Electric wire	Phoenix	Sullivan.
Sept.	23	A. D. Greenwood	28	Machine	1		Finger broken	Falling slate	North West	Greene.
Sept.	23	George Norton	19	Driver			Squeezed hips	Car and rib	Forrest	Vigo.
Sept.	23	Olla Bell	22	Driver			Head cut, leg mashed	Mine car	Erie Canal	Warrick.
Sept.	27	Noble Guyer	20	Driver			End of thumb severed	Car and prop	Freeman	Knox.
Sept.	28	Wm. Opendauff	24	Driver			Bruised face	Kicked by mule	Freeman	Knox.
Sept.	29	W. M. Loyd	46	Loader	1	8	Hurt in back	Falling slate	Consol. Ind. No. 32	Sullivan.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
Sept. 29	Paul Peprick	29	Miner	1	6	....	Bone splintered	Falling slate	Zellar McClellan	Parke.
Sept. 30	Frank Boling	26	Trip rider	1	....	....	Head and shoulder cut	Mine car	Crown Hill No. 4	Vermillion.
Oct. 1	Chas. E. Stull	29	Miner	1	....	....	Pelvic bone broken	Mine car	Elberfeld	Warrick.
Oct. 1	Roy Prutal	21	Driver	1	....	....	Bruised left testicle	Kicked by mule	Riverside	Vigo.
Oct. 1	Henry Johnson	47	Jerryman	1	5	....	Bruised hips and side	Falling slate	Lattas Creek	Greene.
Oct. 1	Mike Meyers	44	Miner	1	....	....	Bruised back	Falling slate	Brazil Block No. 4	Clay.
Oct. 4	L. E. Lgner	24	Driver	....	....	1	Ankle and back sprained	Falling slate	Ayrshire No. 5	Pike.
Oct. 4	Ed. Cunningham	37	Driver	....	....	....	Bruised hips	Falling slate	Vandalia No. 5	Greene.
Oct. 4	Ernest Sisk	23	Driver	....	....	....	Bruised hips	Mine car	Vandalia No. 2	Greene.
Oct. 5	John Wolford	26	Driver	....	....	....	Three ribs broken	Kicked by mule	Lattas Creek	Greene.
Oct. 5	Dave Wesley	31	Driver	1	....	....	Crushed foot	Mine car	Minshall	Vigo.
Oct. 6	Perry Hudson	27	Machine	....	....	....	Bruised knee	Machine	Clover Leaf	Sullivan.
Oct. 6	Fred Fulkerson	21	Driver	1	....	....	Leg broken	Mule	Vandalia No. 5	Greene.
Oct. 7	Wm. Gilmour	19	Driver	....	....	....	Leg bruised	Kicked by mule	Phoenix	Sullivan.
Oct. 7	Roy Bennett	20	Motorman	....	....	....	Back and ankle sprained	Falling slate	Hocking	Sullivan.
Oct. 8	Mike Morrico	43	Miner	....	....	....	Broken ankle	Falling slate	Plymouth No. 1	Vigo.
Oct. 8	John Rolonds	31	Digger	1	....	....	One rib broken	Falling coal	Brazil Block No. 8	Vermillion.
Oct. 10	John Hoovick	32	Driver	1	2	....	Two ribs fractured	Mule	Vandalia No. 5	Greene.
Oct. 11	John Hughs	29	Jerryman	....	....	....	Right foot hurt	Nail pierce	Vandalia No. 10	Sullivan.
Oct. 11	Oscar Warson	20	Miner	....	....	....	Broken leg	Falling slate	Shirley Hill No. 3	Sullivan.
Oct. 13	Thos. Carling	34	....	1	1	....	Cut face, bruised chest	Shot	Vandalia No. 9	Greene.
Oct. 13	John Peroni	28	Miner	1	2	....	Bruised internally	Falling draw slate	Eureka No. 5	Clay.
Oct. 13	August Frodemond	31	Miner	1	4	....	Broken leg	Falling slate	Ind. Block No. 1	Clay.
Oct. 14	William Chapman	35	Timberman	....	....	....	Broken leg	Falling rock	Sunnyside	Vanderburgh.
Oct. 15	Frank Keller	46	Machine	1	4	....	Cut head, bruised chest	Falling coal	Vandalia No. 8	Greene.
Oct. 15	Albert Klensener	21	Driver	....	....	....	Bruised face	Kicked by mule	Vandalia No. 81	Vigo.
Oct. 15	Sylvester Saracosta	45	Miner	1	....	....	Mashed nose	Coal	Vandalia No. 67	Vigo.
Oct. 16	Chas. Buchmer	50	Timberman	1	2	....	Broken foot	Falling slate	Klondyke	Vermillion.
Oct. 18	David Swan	27	Machine	....	....	....	Thumb severed	Machine	Glen Ayr No. 1	Vigo.
Oct. 19	Wm. Howard	51	Timberman	1	....	....	Bone in hand fractured	Falling slate	Clover Leaf	Sullivan.
Oct. 21	James Galloway	33	Cager	1	3	....	Hand cut	Piece of coal	Klondyke	Vermillion.
Oct. 22	John Shinder	32	Shooter	....	....	....	Hand and face burned	Fire from a shot	Klondyke	Vermillion.
Oct. 24	James Dniones	24	Driver	....	....	....	Nose cut	Kicked by mule	Knox	Knox.
Oct. 24	Wm. Neusboum	19	Driver	....	....	....	Collar bone broken	Mine car	Clover Leaf	Sullivan.
Oct. 24	E. C. Coopper	22	Driver	....	....	....	Breast and back hurt	Falling slate	Plymouth No. 1	Vigo.
Oct. 25	Chas. Graves	44	Day man	....	3	....	Hip and head bruised	Falling slate	Crown Hill No. 3	Vermillion.

Oct. 26	Wm. Nehoe	30	Machine	1	2		Finger severed	Machine	Black Creek	Greene.
Oct. 27	Dan Hummel	67	Miner				Eye ball cut	Piece of coal	Princeton	Gibson.
Oct. 28	Jos. Snedden	19	Driver				Back and hips bruised	Mine cars	Shirley Hill No. 3	Sullivan.
Oct. 29	Wm. Jones	56	Miner	1			Bruised arms and legs	Falling coal	Wizard	Clay.
Oct. 29	Albert Niveres	27	Miner	1			Broken leg	Falling coal	Fairview	Parke.
Oct. 29	Joseph Hall	35	Loader				Fractured ribs	Piece of slate	Pittsburg No. 1	Vigo.
Oct. 31	Lawrence Montgomery	18	Driver				Bruised shoulders	Mine car	Littles, Ind	Pike.
Oct. 31	Ray Watson	21	Driver				Broken ribs	Mine car	Black Hawk	Sullivan.
Oct. 31	Stant. Persinger	21	Driver				Broken knee cap	Falling slate	Caledonia	Warrick.
Nov. 1	Wm. Creasby	29	Machine	1	1		Hip bruised	Falling slate	Lattas Creek	Greene.
Nov. 1	Chauncey Carr	17	Driver				Shoulder and ankle bruised	Mine car	Vandalia No. 10	Sullivan.
Nov. 1	Leburn Gross	29	Machine	1			Face bruised, foot hurt	Falling slate	Lattas Creek	Greene.
Nov. 2	Walter Lamb	45	Loader	1	3		Bruised body	Falling slate	Vandalia No. 4	Greene.
Nov. 2	Fred Jones	19	Miner				Leg injured	Pitt running over leg	Crown Hill No. 3	Vermillion.
Nov. 4	Chas. Ryden	37	Miner	1			Hand broken	Falling coal	Princeton	Gibson.
Nov. 4	Geo. Price	40	Miner	1	1		Strained back	Falling slate	Twin No. 4	Greene.
Nov. 4	Chas. Spitlen	19	Driver				Strained foot	Car	Vandalia No. 81	Vigo.
Nov. 5	Alex. Couvilier	21	Driver				Broken leg	Mine car	Vandalia No. 5	Greene.
Nov. 6	Otto Ax	18	Coupler				Broken collar bone	Mine car	Island Valley No. 4	Clay.
Nov. 6	Sam Chaney	27	Miner	1			Finger mashed	Slate	Letsinger	Greene.
Nov. 8	Wm. Poddock	45	Driver	1	4		Bruised hips	Car and rib	Fairview	Parke.
Nov. 9	Herb Creal	39	Miner	1	3		Cut head, back hurt	Rolling coal	Forrest	Vigo.
Nov. 10	Cecil Saliards	22	Driver				Bone in ankle broke	Car	Jackson Hill No. 2	Sullivan.
Nov. 11	John Myers		Miner	1			Cut head, bruised back	Falling coal	Klondyke No. 3	Clay.
Nov. 11	Lafe Thomas	19	Driver				Broken collar bone	Falling off chain	Vandalia No. 5	Greene.
Nov. 12	S. Spaimski	38	Miner				Bruised body	Falling slate	Klondyke	Vermillion.
Nov. 12	Frank Selvie	56					Head, arms and hands hurt	Shot	Grant	Vigo.
Nov. 14	H. C. Raider	45	Night boss	1	3		Injured in the eye	Cable and machine	Vandalia No. 8	Greene.
Nov. 15	Walter Hummel	18	Coupler				Ankle and instep cut	Mine cars	Rainbow	Sullivan.
Nov. 15	Fred Coleman	30	Shooter	1			Arms and neck burned	A shot	Rainbow No. 6	Vermillion.
Nov. 15	Grover Poe	20	Driver				Three ribs broken	Chain and car	Riverside	Vigo.
Nov. 16	Russel May	18	Driver				Mashed foot	Car bumper	Island Valley No. 4	Clay.
Nov. 16	Bert Erwin	24	Driver	1	2		Finger torn open	Chain	Wizard	Clay.
Nov. 17	Frank Moore	35	Driver	1			Squeezed chest	Car and prop	Vandalia No. 2	Greene.
Nov. 17	Thos. Vaughn	28	Asst. electrician				Broken collar bone	Motor and top	Glen Ayr No. 1	Vigo.
Nov. 19	Robert McKee	25	Miner				Mashed breast	Falling coal	Twin No. 5	Greene.
Nov. 19	Thornton Reburger	26	Driver				Bruised back and hips	Mine car	Consol. Ind. No. 32	Sullivan.
Nov. 20	Russell Deal	19	Driver				Crushed hips	Mine car	Tecumseh	Knox.
Nov. 20	J. C. Walters	50	Night boss	1	4		Palm of hand torn	Car door	Jackson Hill No. 2	Sullivan.
Nov. 20	T. Murdock	26	Driver	1	3		Hand mashed	Mine car	Oak Hill No. 50	Vermillion.
Nov. 21	Steve Ramink	22	Miner				Back and legs cut	Falling slate	Jackson Hill No. 2	Sullivan.
Nov. 21	D. F. Ragan	27	Loader	1	1		Face and neck burned	Gas	Plymouth No. 1	Vigo.
Nov. 21	Lewis Marlin	54	Miner	1			Breast bruised	Falling coal	Vandalia No. 69	Vigo.
Nov. 22	Claud Minnis	24	Driver				Wrist hurt	Car and coal	Princeton	Gibson.
Nov. 22	J. N. Stivers	49	Loader	1	8		Arm broke, head cut	Falling rock	Gilmour	Greene.
Nov. 22	James South	45	Cager	1	3		Arm bruised	Cage	Vandalia No. 21	Greene.
Nov. 22	Hiram Vaughn	41	Fireman			1	Body and legs burned	Steam pipe	Littles, Ind	Pike.
Nov. 22	Allen Loveless	45	Trimmer				Hips burned	Steam pipe	Littles, Ind	Pike.

TABLE OF SERIOUS ACCIDENTS—Continued.

Date.	Name.	Age.	Occupation.	Dependents.			Nature of Injury.	Cause of Accident.	Mine.	County.
				Wife.	Children.	Other Dependents.				
Nov. 22	Mac Tnck	33	Shooter	1	....	....	Hands and face burned	Fire from powder	Klondyke	Vermillion.
Nov. 22	Willard King	25	Shooter	....	....	....	Cut in eye	Drill	Vandalia No. 69	Vigo.
Nov. 24	Newt Kisinger	24	Driver	1	....	....	Bruised hip	Car	Green Valley	Greene.
Nov. 25	D. W. Getiger	43	Trimmer	1	3	....	Bruised head and shoulder	Car and coal	Jackson Hill No. 2	Sullivan.
Nov. 26	Frank McVay	25	Driver	1	2	....	Five teeth knocked out	Kicked by mule	Fairview	Parke.
Nov. 26	Floyd Phillips	27	Driver	1	1	....	Arm broken	Kicked by mule	St. Clare	Sullivan.
Nov. 28	James Harper	46	Miner	1	3	....	Leg	Falling coal	Vandalia No. 4	Greene.
Nov. 28	Clarence Everhart	20	Driver	....	....	....	Arm	Mine car	Consol. Ind. No. 32	Sullivan.
Nov. 29	Pete Beaman	17	Driver	....	....	....	Ankle	Mine car	Vandalia No. 2	Greene.
Nov. 29	Louis Spner	37	Driver	....	....	....	Back and leg cut	Mine car	Knox	Knox.
Nov. 29	Henry Lawson	22	Loader	....	....	2	Two fingers broken	Block and chain	Fairview	Parke.
Nov. 29	Eugene Eaves	30	Driver	....	....	....	Jaw bone	Mule	Klondyke	Vermillion.
Nov. 30	Harvey Stites	24	Trimmer	....	....	2	Back injured	Coal shoot	Fairview	Parke.
Nov. 30	Ervey Reynolds	25	Trimmer	1	....	....	Three ribs broken	Coal shoot	Fairview	Parke.
Dec. 1	Ed Riggles	27	Loader	1	....	....	Ribs broken, bruised knee	Falling slate	Vandalia No. 9	Greene.
Dec. 2	A. Marcine	25	Miner	....	....	....	Back and ribs bruised	Mine car	Oak Hill No. 50	Vermillion.
Dec. 3	David Morgan	25	Car coupler	....	....	2	Finger amputated	Mine cars	Dickson	Greene.
Dec. 3	Robert Foster	27	Jerry	1	3	....	Arm broken, head cut	Falling slate	Forrest	Vigo.
Dec. 5	Clyde McKinney	20	Driver	1	....	....	Ribs broken, back sprained	Mine cars, mule	Vandalia No. 10	Sullivan.
Dec. 10	Wm. Carte	35	Night boss	....	....	....	Broken leg	Falling slate	Princeton	Gibson.
Dec. 12	S. Jackson	56	Miner	....	....	....	Foot broken, leg bruised	Falling coal	Oak Hill No. 50	Vermillion.
Dec. 10	Arthur Bowhholz	14	Miner	....	....	....	Hand cut	Loaded car and roof	Plymouth No. 1	Vigo.
Dec. 12	Frank Johnson	30	Miner	1	1	....	Leg broken	Falling coal	Freeman	Knox.
Dec. 13	Joseph Hyde	32	Machine runner	1	....	....	Leg, ribs broken, cut and bruis'd	Falling slate	C. & I.	Sullivan.
Dec. 13	Elmer Gardner	48	Machine runner	1	5	....	Leg broken	Mining machine	Freeman	Knox.
Dec. 13	Oscar Walters	25	Loader	1	1	....	Head cut, back, side bruised	Falling coal and slate	Rainbow	Sullivan.
Dec. 15	Wm. Bell	35	Loader	....	....	....	Arm broken, crushed	Falling slate	Knox	Knox.
Dec. 15	Wm. Batter	30	Loader	....	....	....	Leg broken, crushed, bruised	Falling slate	Tecumseh No. 1	Knox.
Dec. 15	Wm. Bell	35	Miner	....	....	....	Bruised arm and back	Falling slate	Knox	Knox.
Dec. 15	Stanley Mushka	35	Miner	....	....	....	Arms broken	Going back on shot	Grant No. 3	Vigo.
Dec. 16	Dennie Church	32	Helping motor	1	....	....	End of thumb severed	By trolley pole	Vandalia No. 67	Vigo.
Dec. 16	John Corgate	36	Day man	1	4	....	Mashed hip and leg	Falling slate	Superior No. 5	Parke.
Dec. 16	Crawford Riley	23	Driver	....	....	1	Hand broken	Mule	Averill No. 1	Sullivan.
Dec. 17	Earl Weaver	27	Miner	1	2	....	Paralyzed below waist	Falling slate	Vandalia No. 2	Greene.
Dec. 17	Fred Pentz	22	Miner	1	....	....	Thumb severed at first joint	Falling coal	Crawford No. 10	Clay.
Dec. 19	Joe Dorman	51	Flat trimmer	....	....	....	Skull fractured	Falling, striking head	Jackson Hill No. 2	Sullivan.

Dec. 19	Roscoe Hall	22	Trackman	....	....	....	Finger severed end	Coal on car and roof	Reliance	Sullivan.
Dec. 19	H. F. Cobb	36	Shot firer	....	....	....	Burns on face and hands	Discharging shots	Carlisle	Sullivan.
Dec. 19	Steve Waucheski	29	Miner	1	....	....	Leg broken and bruised	Falling coal	Jackson Hill No. 2	Sullivan.
Dec. 20	Bill Order	44	Miner	....	....	....	Burned face, hands and body	Explosion of powder	Chandler	Warrick.
Dec. 22	Sam Ashpy	30	Loader	1	2	....	Back broken or fracture, spine	Falling slate	Freeman	Knox.
Dec. 22	Stane Ruzanick	24	Loader	....	....	....	Foot mashed	Mine car	Vandalia No. 9	Greene.
Dec. 23	Wm. Muchmore	24	Driver	1	3	....	Leg broken and bruised	Falling from mine car	Blackburn No. 2	Pike.
Dec. 24	Joe Bubolo	33	Driver	1	1	....	Head cut and body bruised	Mule and mine cars	Klondyke	Vermillion.
Dec. 27	E. E. Nation	52	Top boss	1	3	....	Arm broken	Fly-wheel on engine	Clover Leaf	Sullivan.
Dec. 27	Arch Maxwell	30	Driver	1	....	....	Fingers bruised	Mine cars and boulder	Crown Hill No. 1	Vermillion.
Dec. 27	Arch Foxworthy	19	Loader	....	....	....	Finger severed	Crowbar and lump of coal	Domestic No. 1	Vigo.
Dec. 28	Mike Coffee	20	Driver	....	....	....	Collar bone fractured	Loaded mine car	Ayrshire No. 4	Pike.
Dec. 28	Joe Reso	21	Tracklayer	1	....	....	Finger severed	....	Crown Hill No. 1	Vermillion.
Dec. 28	Chas. McMahon	26	Jerry	....	....	....	Hip cut and bruised ankle	Mine car and rib	Dickson	Greene.
Dec. 29	Chas. Kolomskas	30	Shot firer	....	....	....	Burned head, face and hands	Discharging shots	Klondyke	Vermillion.
Dec. 29	John Miller	27	Machine runner	....	....	....	Bruised abdomen	Mining machine	Peacock No. 2	Pike.
Dec. 29	William Green	45	Miner	1	....	....	Dislocated ankle	Falling slate	Ayrshire No. 4	Pike.
Dec. 30	Chas. Schoffer	25	Driver	....	....	....	Cut and bruised face	Mule	Vandalia No. 69	Vigo.
Dec. 30	Robert Ferlls	30	Jerry	1	2	....	Hand broken and bruised hips	Falling slate	....	

ACCIDENTS TO MINE PROPERTY.

The following is a brief description of each of the most notable accidents occurring to mine property during the year 1910.

Blackburn Mine No. 2, Pike County: At firing time on the afternoon of January 7th a windy shot due to an excessive overcharge of powder caused an explosion of powder gases, resulting in considerable damage to the mine property. Fortunately no persons were injured. We were unable to learn the financial loss.

Riverside Mine, Vigo County: A serious explosion of powder gases, blasting powder and coal dust combined occurred in this mine on the evening of January 8th, caused by a blown-out shot, the flames from which exploded a keg of powder carelessly left within range of the shot. Added to these forces was an amount of carbon monoxide, distilled from some very fine coal dust hurled into the flames from the blast and those of the exploding powder, the dust in this mine being of a highly inflammable nature. No person was injured, due to the fact that all the workmen were out of the mine except the shot firers, two in number, who were on the opposite side of the mine to that of the explosion when it occurred. Some little property damage, however, resulted, the amount of which we did not learn.

Consolidated No. 33 Mine, Sullivan County: A fire of incendiary origin occurred in this mine Sunday, January 16. The fire was discovered in a short time after it had started and was extinguished before it had gained much headway. The loss to property amounted to about $300.

Vandalia No. 67 Mine, Vigo County: A serious gob fire occurred in this mine on the night of January 26. By the time the fire was discovered, i. e., early on the morning of the following day, it had gained such headway that it was impossible to enter the mine by means of the main hoisting shaft. A number of brattices were constructed and the fire sealed off and gotten under control during the forenoon of the 28th. In sealing off the fire it was necessary to construct brattices across some of the principal entries and air courses, necessitating the mine to remain idle fifteen days, at which time the seals were broken and the fire was found to have been extinguished. The financial loss was estimated at ten thousand dollars.

Wheatland Mine, Knox County: An explosion caused by a number of badly placed shots occurred in this mine February

26th, resulting in considerable damage to the mine but no injury to persons.

Hocking Mine, Sullivan County: The entire top works at this mine, including engine and boiler-room and tipple, were destroyed by fire July 23d, in addition to which fifteen valuable mine mules were lost, having been suffocated by smoke. The financial loss was estimated at $8,500.

Miami No. 6 Mine, Vigo County: An explosion caused by a number of shots placed in violation of statute occurred at 3:30 p. m., firing time, September 17th, resulting in the destruction of the fan casing and the stairway in the escape shaft being torn out. No estimate as to amount of financial loss was secured.

Reliance Mine, Sullivan County: A gob fire which had been burning for several months and had been sealed off with brattices composed of dirt, coal slack, slate and timbers, burned through one of these brattices on the night of October 16th and for a time threatened to destroy the entire property. The company employed all of their regular day men that they could get to work, combating the fire until Tuesday morning at 11 o'clock, the 19th, at which time the mine committee ordered all the day men out of the mine. This resulted in a serious handicap to the efforts of the company to exteinguish the fire, but with the aid of all their monthly men the fire was finally gotten under control, and was again sealed off. This act of the mine committee was committed through pure spite to the mine boss and superintendent. No financial loss given.

Black Creek Mine, Greene County: The tipple, fan house and blacksmith shop at this mine were destroyed by fire October 29th. Financial loss $8,000.

MINE DIRECTORY.

CLAY COUNTY.

Name of Company.	Address of Company.	Name of Mine.
Bee Ridge Coal Co	Brazil	Bee Ridge.
Crawford Coal Co	Brazil	Crawford No. 11.
Crawford Coal Co	Brazil	Crawford No. 6.
Crawford Coal Co	Brazil	Crawford No. 10.
McClelland Block Coal Co	Brazil	Brazil No. 4.
Indiana Block Coal Co	Saline City	Indiana Block No. 1.
Coal Bluff Mining Co	Terre Haute	Plymouth No. 2.
C. Ehrlich Coal Co	Turner	Klondyke No. 3.
American Clay Manufacturing Co	Brazil	Monarch.
Eureka Block Coal Co	Terre Haute	Eureka No. 5.
Treager Bros	Brazil	Treager.
Harrison Coal & Mining Co	Clay City	Harrison No. 5.
Hall & Zimmerman	Brazil	Wizard.
Progressive Coal & Mining Co	Brazil	Progressive.
Big Vein Mining Co	Terre Haute	Lewis.
Vivian Colliers Co	Chicago, Ill	Vivian No. 1.
Vivian Colliers Co	Chicago, Ill	Vivian No. 2.
United Fourth Vein Coal Co	Linton	Island Valley No. 4.
German Coal Co	Brazil	German No. 1.
Schrepferman Coal Co	Brazil	Schrepferman No. 1.
Schrepferman Coal Co	Brazil	Schrepferman No. 2.

DAVIESS COUNTY.

Daviess County Coal Co	Montgomery	Montgomery No. 4.
Horney & Winterbottom	Washington	No. 3.
Mutual Mining Co	Cannelburg	Mutual.
Mandabach Bros	Washington	Mandabach.
Winklepeck & Overton	Raglesville	Winklepeck.

FOUNTAIN COUNTY.

Rush Coal Co	Toledo, Ohio	Indio.

GIBSON COUNTY.

Princeton Coal & Mining Co	Princeton	Oswald.
Fort Branch Coal & Mining Co	Fort Branch	Fort Branch.
Wyoming Coal Co	Francisco	Francisco.

GREENE COUNTY.

United Fourth Vein Coal Co	Linton	Black Creek.
United Fourth Vein Coal Co	Linton	Dickason.
United Fourth Vein Coal Co	Linton	Sponsler.
United Fourth Vein Coal Co	Linton	Antioch.
United Fourth Vein Coal Co	Linton	North Linton.
Vandalia Coal Co	Indianapolis	Vandalia No. 2.
Vandalia Coal Co	Indianapolis	Vandalia No. 4.
Vandalia Coal Co	Indianapolis	Vandalia No. 5.
Vandalia Coal Co	Indianapolis	Vandalia No. 8.
Vandalia Coal Co	Indianapolis	Vandalia No. 9.
Vandalia Coal Co	Indianapolis	Vandalia No. 20.
Vandalia Coal Co	Indianapolis	Vanadlia No. 21.
Alliance Coal Co	Chicago, Ill	Gilmour.
Alliance Coal Co	Chicago, Ill	Lattas Creek.
Summit Coal & Mining Co	Bloomfield	Summit No. 2.
Green Valley Coal Co	Jasonville	Green Valley.
Queen Coal & Mining Co	Jasonville	Queen.
Calora Coal Co	Indianapolis	North West.
Coal Bluff Mining Co	Terre Haute	Twin No. 4.
Coal Bluff Mining Co	Terre Haute	Twin No. 5.
Robertson Bros. Coal Co	Linton	Cherry Hill.
Florence Coal Co	Bloomfield	Letsinger.
McKircker Bros. Coal Co	Midland	P. & I.

KNOX COUNTY.

Name of Company.	Address of Company.	Name of Mine.
Knox Coal Co	Bicknell	Knox.
Lynn Coal Co	Bicknell	Lynn.
Freeman Coal Co	Bicknell	Freeman.
Bicknell Coal Co	Bicknell	Bicknell.
Washington-Wheatland Coal Co	Wheatland	Wheatland.
Tecumseh Coal & Mining Co	Bicknell	Tecumseh.

PARKE COUNTY.

McClelland Block Coal Co	Brazil	Brazil No. 9.
Zellar McClellan & Co	Brazil	Superior No. 2.
Zellar McClellan & Co	Brazil	Superior No. 3.
Zellar McClellan & Co	Brazil	Superior No. 5.
Fairview Coal Co	Mecca	Fairview.
Parke County Coal Co	Rosedale	Parke No. 11.
Parke County Coal Co	Rosedale	Parke No. 12.
Vivian Colliers	Chicago, Ill	Lyford No. 1.
James Moore	Kingman	Moore.
W. P. Harrison	Kingman	Harrison.
S. B. Coal Co	Kingman	No. 1.

PERRY COUNTY.

Lincoln Coal & Mining Co	Evansville	Lincoln.

PIKE COUNTY.

Ayrshire Coal Co	Oakland City	Ayrshire No. 4.
Ayrshire Coal Co	Oakland City	Ayrshire No. 5.
Central Indiana Coal & Mining Co	St. Louis	Muren.
S. W. Little Coal Co	Evansville	Blackburn No. 1.
S. W. Little Coal Co	Evansville	Blackburn No. 2.
S. W. Little Coal Co	Evansville	Littles.
Winslow Gas & Coal Co	Winslow	Winslow No. 4.
Winslow Gas & Coal Co	Winslow	Winslow No. 5.
J. W. Welsh	New York, N. Y	Hartwell No. 1.
J. W. Welsh	New York, N. Y	Hartwell No. 2.
J. W. Welsh	New York, N. Y	Hartwell No. 3.
Peacock Coal & Mining Co	Indianapolis	Peacock No. 2.

SULLIVAN COUNTY.

Alliance Coal Co	Chicago, Ill	Rainbow.
Alliance Coal Co	Chicago, Ill	Phoenix No. 4.
Alliance Coal Co	Chicago, Ill	Hocking.
Alliance Coal Co	Chicago, Ill	Mammoth.
Sunflower Coal Co	Dugger	Sunflower.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 25.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 26.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 28.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 30.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 32.
Consolidated Indiana Coal Co	Chicago, Ill	Consolidated No. 33.
Vandalia Coal Co	Indianapolis	Vandalia No. 10.
Jackson Hill Coal & Coke Co	Terre Haute	Jackson Hill No. 2.
Jackson Hill Coal & Coke Co	Terre Haute	Jackson Hill No. 4.
Gregory Coal & Mining Co	Shelburn	Keystone.
Brazil Block Coal Co	Chicago, Ill	Dering No. 13.
Brazil Block Coal Co	Chicago, Ill	Dering No. 14.
Shirley Hill Coal Co	Indianapolis	Shirley Hill No. 3.
Shirley Hill Coal Co	Indianapolis	Little Giant.
Shirley Hill Coal Co	Indianapolis	Clover Leaf.
Chicago-Indianapolis Coal Co	Linton	C. & I.
Kettle Creek Coal Co	Terre Haute	Pearl.
Peabody-Alwart Coal & Mining Co	Chicago, Ill	Reliance.
United Fourth Vein Coal Co	Linton	Black Hawk.
Carlisle Coal & Clay Co	Carlisle	Viola.
W. C. Hall Mining Co	Dugger	Freeman.
Bellevue Coal Co	Carlisle	Bellevue.
Larsh Coal Co	Farmersburg	Larsh.
Averill Coal Co	Hymera	Averill.
Sullivan County Coal, Product & Mining Co	Chicago, Ill	Hudson-Superior.

VANDERBURGH COUNTY.

Name of Company.	Address of Company.	Name of Mine.
Diamond Coal Co	Evansville	Diamond.
Gibson-Moore Coal Co	Evansville	Ingleside.
Sunnyside Coal Co	Evansville	Sunnyside.
Crescent Coal Co	Evansville	Unity.
Banner Coal Co	Evansville	First Avenue.

VERMILLION COUNTY.

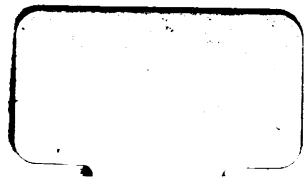
Brazil Block Coal Co	Clinton	Dering No. 8.
Silverwood Coal Co	Cayuga	Eureka.
Clinton Coal Co	Clinton	Crown Hill No. 1.
Clinton Coal Co	Clinton	Crown Hill No. 2.
Clinton Coal Co	Clinton	Crown Hill No. 3.
Clinton Coal Co	Clinton	Crown Hill No. 4.
Oak Hill Coal Co	Clinton	Oak Hill No. 50.
Oak Hill Coal Co	Clinton	Maple Valley.
Oak Hill Coal Co	Clinton	Buckeye No. 2.
Oak Hill Coal Co	Clinton	Klondyke No. 19.
Clinton Coal Co	Clinton	Crown Hill No. 5.

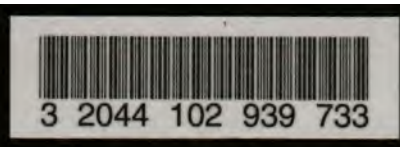
VIGO COUNTY.

Vandalia Coal Co	Indianapolis	Vandalia No. 66.
Vandalia Coal Co	Indianapolis	Vandalia No. 67.
Vandalia Coal Co	Indianapolis	Vandalia No. 69.
Vandalia Coal Co	Indianapolis	Vandalia No. 81.
Alliance Coal Co	Chicago, Ill	Forrest.
Coal Bluff Mining Co	Terre Haute	Riverside.
Coal Bluff Mining Co	Terre Haute	Plymouth No. 1.
Coal Bluff Mining Co	Terre Haute	Wabash.
Coal Bluff Mining Co	Terre Haute	Minshall.
Lower Vein Coal Co	Terre Haute	Lower Vein.
Miami Coal Co	Brazil	Miami No. 2.
Miami Coal Co	Brazil	Miami No. 4.
Miami Coal Co	Brazil	Miami No. 5.
Miami Coal Co	Brazil	Miami No. 6.
Otter Creek Coal Co	Chicago, Ill	Mary No. 2.
Fauvre Coal Co	Indianapolis	Fauvre No. 2.
Deep Vein Coal Co	Terre Haute	Deep Vein No. 4.
Deep Vein Coal Co	Terre Haute	Deep Vein No. 5.
Grant Coal & Mining Co	Burnett	Giant No. 3.
Vigo County Coal Co	Seeleyville	Ray No. 2.
Sugar Valley Coal Co	West Terre Haute	Sugar Valley.
Brazil Block Coal Co	Clinton	Dering No. 6.
Domestic Block Coal Co	Kokomo	Domestic Block No. 1.
National Coal & Fuel Co	West Terre Haute	National.
Glenn Ayr Coal Co	Terre Haute	Glenn Ayr No. 1.
Glenn Ayr Coal Co	Terre Haute	Glenn Ayr No. 2.
Pittsburg Mining Co	Terre Haute	Pittsburg No. 1.
Retlaw Mining Co	Atherton	Atherton.
C. A. Nash	Coal Bluff	Nash.
Jackson Hill Coal & Coke Co	Terre Haute	Jackson Hill No. 5.

WARRICK COUNTY.

Big Four Coal Co	Boonville	Big Four.
Chandler Coal Co	Evansville	Chandler.
C. Menden Coal Co	Evansville	De Forrest.
T. D. Scales	Boonville	Electric.
Caledonia Mining Co	Boonville	Dawson.
Erie Canal Coal Co	Boonville	Erie Canal.
Red Shaft Coal Co	Newburg	Red Shaft.
Worsham-Newburg Coal Co	Newburg	Brixius.
J. Wooley Coal Co	Boonville	Polk No. 5.
J. Wooley Coal Co	Boonville	Castle Garden.
Elberfeld Oil, Gas & Mining Co	Elberfeld	Elberfield.
Epworth Coal Co	Newburg	Epworth.
Henry Korff	Boonville	Korff.
Sargent Coal Co	Newburg	Sargent.
Wilson Wire Coal Co	Boonville	Bull.

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